

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION 02 ☐ OBSERVED (DATE: 6/8/83) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: unknown 04 NARRATIVE DESCRIPTION

Immediate vicinity obtains water from unaffected public source. The potential exists to contaminate Patuxent Aquifer which supplies water east of site. Analysis of water from monitoring wells collected by FIT III on 6/8/83 showed contamination.

01 ☐ B. SURFACE WATER CONTAMINATION 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None known

01 ☐ C. CONTAMINATION OF AIR 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None known

01 ☒ D. FIRE/EXPLOSIVE CONDITIONS 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: unknown 04 NARRATIVE DESCRIPTION

Methane gas venting trench installed to prevent gas migration to nearby residences.

01 ☐ E. DIRECT CONTACT 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None known or expected

01 ☒ F. CONTAMINATION OF SOIL 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: 130 04 NARRATIVE DESCRIPTION
(Acres)

Potential exists as site is not lined.

01 ☐ G. DRINKING WATER CONTAMINATION 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: N/A 04 NARRATIVE DESCRIPTION

N/A for immediate vicinity population - Patuxent Aquifer supplies water for eastern Virginia.

01 ☐ H. WORKER EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None known

01 ☐ I. POPULATION EXPOSURE/INJURY 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

None known

ORIGINAL
(Red)

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT		I. IDENTIFICATION	
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS		01 STATE VA	02 SITE NUMBER 124
II. HAZARDOUS CONDITIONS AND INCIDENTS <i>(Continued)</i>			
<div style="display: flex; justify-content: space-between;"><div>01 <input type="checkbox"/> J. DAMAGE TO FLORA 04 NARRATIVE DESCRIPTION</div><div>02 <input type="checkbox"/> OBSERVED (DATE: _____) <input type="checkbox"/> POTENTIAL <input type="checkbox"/> ALLEGED</div></div> <p style="margin-top: 10px;">N/A</p>			
<div style="display: flex; justify-content: space-between;"><div>01 <input type="checkbox"/> K. DAMAGE TO FAUNA 04 NARRATIVE DESCRIPTION <i>(Include name(s) of species)</i></div><div>02 <input type="checkbox"/> OBSERVED (DATE: _____) <input type="checkbox"/> POTENTIAL <input type="checkbox"/> ALLEGED</div></div> <p style="margin-top: 10px;">N/A</p>			
<div style="display: flex; justify-content: space-between;"><div>01 <input type="checkbox"/> L. CONTAMINATION OF FOOD CHAIN 04 NARRATIVE DESCRIPTION</div><div>02 <input type="checkbox"/> OBSERVED (DATE: _____) <input type="checkbox"/> POTENTIAL <input type="checkbox"/> ALLEGED</div></div> <p style="margin-top: 10px;">N/A</p>			
<div style="display: flex; justify-content: space-between;"><div>01 <input type="checkbox"/> M. UNSTABLE CONTAINMENT OF WASTES <i>(Spills, Runoff, Standing liquids, Leaking drums)</i> 03 POPULATION POTENTIALLY AFFECTED: _____</div><div>02 <input type="checkbox"/> OBSERVED (DATE: _____) <input type="checkbox"/> POTENTIAL <input type="checkbox"/> ALLEGED 04 NARRATIVE DESCRIPTION</div></div> <p style="margin-top: 10px;">N/A</p>			
<div style="display: flex; justify-content: space-between;"><div>01 <input type="checkbox"/> N. DAMAGE TO OFFSITE PROPERTY 04 NARRATIVE DESCRIPTION</div><div>02 <input type="checkbox"/> OBSERVED (DATE: _____) <input type="checkbox"/> POTENTIAL <input type="checkbox"/> ALLEGED</div></div> <p style="margin-top: 10px;">None known</p>			
<div style="display: flex; justify-content: space-between;"><div>01 <input type="checkbox"/> O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 04 NARRATIVE DESCRIPTION</div><div>02 <input type="checkbox"/> OBSERVED (DATE: _____) <input type="checkbox"/> POTENTIAL <input type="checkbox"/> ALLEGED</div></div> <p style="margin-top: 10px;">None known</p>			
<div style="display: flex; justify-content: space-between;"><div>01 <input checked="" type="checkbox"/> P. ILLEGAL/UNAUTHORIZED DUMPING 04 NARRATIVE DESCRIPTION</div><div>02 <input type="checkbox"/> OBSERVED (DATE: _____) <input type="checkbox"/> POTENTIAL <input checked="" type="checkbox"/> ALLEGED</div></div> <p style="margin-top: 10px;">The city of Richmond believes, through heresay, that some hazardous waste may have been dumped at the site.</p>			
05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS			
None known			
III. TOTAL POPULATION POTENTIALLY AFFECTED: _____			
IV. COMMENTS			
None			
V. SOURCES OF INFORMATION <i>(Cite specific references, e.g., state files, sample analysis, reports)</i>			
NUS - Preliminary Assessment dated 6/16/83			

ORIGINAL
(Red)

**POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION**

I. IDENTIFICATION

01 STATE VA	02 SITE NUMBER 24
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II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
<input type="checkbox"/> A. NPDES				
<input type="checkbox"/> B. UIC				
<input type="checkbox"/> C. AIR				
<input type="checkbox"/> D. RCRA				
<input type="checkbox"/> E. RCRA INTERIM STATUS				
<input type="checkbox"/> F. SPCC PLAN				
<input checked="" type="checkbox"/> G. STATE (Specify) Solid Waste Management	No. 290	7/16/82	open	valid until revoked or operations are terminated:
<input type="checkbox"/> H. LOCAL (Specify)				operations ceased in Sept. 1983
<input type="checkbox"/> I. OTHER (Specify)				
<input type="checkbox"/> J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE	04 TREATMENT (Check all that apply)	05 OTHER
<input type="checkbox"/> A. SURFACE IMPOUNDMENT <input type="checkbox"/> B. PILES <input type="checkbox"/> C. DRUMS, ABOVE GROUND <input type="checkbox"/> D. TANK, ABOVE GROUND <input type="checkbox"/> E. TANK, BELOW GROUND <input checked="" type="checkbox"/> F. LANDFILL <input type="checkbox"/> G. LANDFARM <input type="checkbox"/> H. OPEN DUMP <input type="checkbox"/> I. OTHER (Specify)			<input type="checkbox"/> A. INCENERATION <input type="checkbox"/> B. UNDERGROUND INJECTION <input type="checkbox"/> C. CHEMICAL/PHYSICAL <input type="checkbox"/> D. BIOLOGICAL <input type="checkbox"/> E. WASTE OIL PROCESSING <input type="checkbox"/> F. SOLVENT RECOVERY <input type="checkbox"/> G. OTHER RECYCLING/RECOVERY <input type="checkbox"/> H. OTHER (Specify)	<input checked="" type="checkbox"/> A. BUILDINGS ON SITE 06 AREA OF SITE 130 (Acres)

07 COMMENTS

None

IV. CONTAINMENT**01 CONTAINMENT OF WASTES (Check one)**

☐ A. ADEQUATE, SECURE
 ☒ B. MODERATE
 ☐ C. INADEQUATE, POOR
 ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

Leachate collection system in operation. Cover material applied to active portion of landfill.

V. ACCESSIBILITY01 WASTE EASILY ACCESSIBLE: ☐ YES ☒ NO**02 COMMENTS**

Site is fenced.

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

NUS - Preliminary Assessment dated 6/16/83

R. Stuart Royer and Associates, Inc. Report to city of Richmond's Department of Public Works dated 10/21/81

ORIGINAL
(Red)



**POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA**

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)		02 STATUS			03 DISTANCE TO SITE
COMMUNITY	SURFACE A. <input checked="" type="checkbox"/> B. <input type="checkbox"/>	WELL C. <input type="checkbox"/> D. <input type="checkbox"/>	ENDANGERED A. <input type="checkbox"/> D. <input type="checkbox"/>	AFFECTED B. <input type="checkbox"/> E. <input type="checkbox"/>	MONITORED C. <input checked="" type="checkbox"/> F. <input type="checkbox"/>
NON-COMMUNITY					A. 3 (mi) B. (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING ☐ B. DRINKING (Other sources available)
COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)

☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)

☒ D. NOT USED, UNUSEABLE
Patuxent Aquifer is used for water in eastern Virginia.

02 POPULATION SERVED BY GROUND WATER N/A		03 DISTANCE TO NEAREST DRINKING WATER WELL N/A (mi)		
04 DEPTH TO GROUNDWATER 7-60 (ft)	05 DIRECTION OF GROUNDWATER FLOW south	06 DEPTH TO AQUIFER OF CONCERN (ft)	07 POTENTIAL YIELD OF AQUIFER unknown (gpd)	08 SOLE SOURCE AQUIFER <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO

09 DESCRIPTION OF WELLS (including usage, depth, and location relative to population and buildings)

N/A

10 RECHARGE AREA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	COMMENTS Partial recharge area of Patuxent Aquifer.	11 DISCHARGE AREA <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	COMMENTS
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IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☒ A. RESERVOIR, RECREATION DRINKING WATER SOURCE ☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES ☐ C. COMMERCIAL, INDUSTRIAL ☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
Gillies Creek	<input type="checkbox"/>	along border (mi)
	<input type="checkbox"/>	(mi)
	<input type="checkbox"/>	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN			02 DISTANCE TO NEAREST POPULATION
ONE (1) MILE OF SITE A. approx. 20,000 NO. OF PERSONS	TWO (2) MILES OF SITE B. approx. 40,000 NO. OF PERSONS	THREE (3) MILES OF SITE C. approx. 70,000 NO. OF PERSONS	< 1/4 (mi)
03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE unknown		04 DISTANCE TO NEAREST OFF-SITE BUILDING < 1/4 (mi)	

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

City of Richmond is densely populated (urban area). Population of Richmond is 219,429 (Henrico Co. Map, 1981), populations near site approximated from total population.

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SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☒ A. $10^{-6} - 10^{-8}$ cm/sec ☐ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☒ A. IMPERMEABLE
(Less than 10^{-6} cm/sec) ☐ B. RELATIVELY IMPERMEABLE
($10^{-4} - 10^{-6}$ cm/sec) ☐ C. RELATIVELY PERMEABLE
($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE
(Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK

150-200 (ft)

04 DEPTH OF CONTAMINATED SOIL ZONE

depth of landfill 70-100 (ft)

05 SOIL pH

unknown

06 NET PRECIPITATION

9 (in)

07 ONE YEAR 24 HOUR RAINFALL

2.5 - 3.0 (in)

08 SLOPE
SITE SLOPE

25 %

DIRECTION OF SITE SLOPE

north to south

TERRAIN AVERAGE SLOPE

25 %

09 FLOOD POTENTIAL

SITE IS IN N/A YEAR FLOODPLAIN

10

☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE

OTHER

A. N/A (mi)B. N/A (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)

N/A (mi)ENDANGERED SPECIES: N/A

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL

RESIDENTIAL AREAS; NATIONAL/STATE PARKS,
FORESTS, OR WILDLIFE RESERVESAGRICULTURAL LANDS
PRIME AG LAND AG LANDA. < 1/2 (mi)B. < 1/4 (mi)C. N/A (mi) D. N/A (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

Before development of landfill, the topography sloped to the south towards Gillies Creek. The active landfill area was built to a greater elevation than the immediately surrounding topography.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NUS - Preliminary Assessment dated 6/16/83 (F3-8212-37)

R. Stuart Royer and Associates, Inc. Report to city of Richmond's Department of Public Works dated 10/21/81

U.S.G.S. Quadrangle Map of Richmond, Virginia

Interview with Ken Chestnut, Virginia State Department of Health, by William Wentworth of

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	8 org/8 inorg	Environmental Research Group 117 North First Street, Ann Arbor, MI 48104	
SURFACE WATER			RESULTS
WASTE			
AIR			PRESENTLY
RUNOFF Ponded water	1 org/1 inorg	SAME AS ABOVE	
SPILL			AVAILABLE
SOIL leachate sediments	2 org/2 inorg	SAME AS ABOVE	
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
pH	groundwater pH varied from 5.6 to 7.0

IV. PHOTOGRAPHS AND MAPS

01 TYPE <input checked="" type="checkbox"/> GROUND <input type="checkbox"/> AERIAL	02 IN CUSTODY OF <u>NUS Corporation</u> <small>(Name of organization or individual)</small>
03 MAPS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	04 LOCATION OF MAPS <u>Appendix of FIT III Site Inspection Report</u>

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

N/A

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Chain of Custody, Traffic Reports

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SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

II. CURRENT OWNER(S)				PARENT COMPANY (If applicable)			
01 NAME City of Richmond		02 D+B NUMBER		08 NAME N/A		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY Richmond		06 STATE VA	07 ZIP CODE 23219	12 CITY		13 STATE	14 ZIP CODE
01 NAME N/A		02 D+B NUMBER		08 NAME N/A		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY		06 STATE	07 ZIP CODE	12 CITY		13 STATE	14 ZIP CODE
01 NAME N/A		02 D+B NUMBER		08 NAME N/A		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY		06 STATE	07 ZIP CODE	12 CITY		13 STATE	14 ZIP CODE
01 NAME N/A		02 D+B NUMBER		08 NAME N/A		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY		06 STATE	07 ZIP CODE	12 CITY		13 STATE	14 ZIP CODE
III. PREVIOUS OWNER(S) (List most recent first)				IV. REALTY OWNER(S) (If applicable, list most recent first)			
01 NAME Unknown		02 D+B NUMBER		01 NAME N/A		02 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	
05 CITY		06 STATE	07 ZIP CODE	05 CITY		06 STATE	07 ZIP CODE
01 NAME N/A		02 D+B NUMBER		01 NAME N/A		02 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	
05 CITY		06 STATE	07 ZIP CODE	05 CITY		06 STATE	07 ZIP CODE
01 NAME N/A		02 D+B NUMBER		01 NAME N/A		02 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	
05 CITY		06 STATE	07 ZIP CODE	05 CITY		06 STATE	07 ZIP CODE
V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)							
NUS - Preliminary Assessment dated 6/16/83							

ORIGINAL
(Red)



**POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION**

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

II. CURRENT OPERATOR (Provide if different from owner)

OPERATOR'S PARENT COMPANY (If applicable)

01 NAME Mr. Ryman Jones	02 D+B NUMBER	10 NAME N/A	11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.) East Richmond Road	04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE
05 CITY Richmond	06 STATE VA	07 ZIP CODE 23219	14 CITY 15 STATE 16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER city of Richmond		

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

01 NAME N/A	02 D+B NUMBER	10 NAME N/A	11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	14 CITY 15 STATE 16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD		

01 NAME N/A	02 D+B NUMBER	10 NAME N/A	11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	14 CITY 15 STATE 16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD		

01 NAME N/A	02 D+B NUMBER	10 NAME N/A	11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	14 CITY 15 STATE 16 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD		

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NUS - Preliminary Assessment dated 6/16/83

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ D. SPILLED MATERIAL REMOVED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ E. CONTAMINATED SOIL REMOVED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ F. WASTE REPACKAGED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ G. WASTE DISPOSED ELSEWHERE
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ H. ON SITE BURIAL
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ I. IN SITU CHEMICAL TREATMENT
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ J. IN SITU BIOLOGICAL TREATMENT
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ K. IN SITU PHYSICAL TREATMENT
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ L. ENCAPSULATION
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ M. EMERGENCY WASTE TREATMENT
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ N. CUTOFF WALLS
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☒ O. EMERGENCY DIKING/SURFACE WATER DIVERSION
04 DESCRIPTION

02 DATE 1960

03 AGENCY city of Richmond

Prior to landfilling operation, Gillies Creek was rechanneled south of the site.

01 ☐ P. CUTOFF TRENCHES/SUMP
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ Q. SUBSURFACE CUTOFF WALL
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

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(Red)



POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
VA 124

II. ON-SITE GENERATOR

01 NAME N/A	02 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	
05 CITY	06 STATE 07 ZIP CODE	

III. OFF-SITE GENERATOR(S)

01 NAME Various/Unknown	02 D+B NUMBER	01 NAME N/A	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE 07 ZIP CODE	05 CITY	06 STATE 07 ZIP CODE
01 NAME N/A	02 D+B NUMBER	01 NAME N/A	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE 07 ZIP CODE	05 CITY	06 STATE 07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME Various/Unknown	02 D+B NUMBER	01 NAME N/A	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE 07 ZIP CODE	05 CITY	06 STATE 07 ZIP CODE
01 NAME N/A	02 D+B NUMBER	01 NAME N/A	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE 07 ZIP CODE	05 CITY	06 STATE 07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

ORIGINAL
(Red)



POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
VA	124

II. PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☒ S. CAPPING/COVERING
04 DESCRIPTION

02 DATE 9/83

03 AGENCY city of Richmond

Capped and closed, according to the Royer and Associates plan.

01 ☐ T. BULK TANKAGE REPAIRED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ U. GROUT CURTAIN CONSTRUCTED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ V. BOTTOM SEALED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☒ W. GAS CONTROL
04 DESCRIPTION

02 DATE unknown

03 AGENCY city of Richmond

Methane gas venting constructed to prevent gas migration.

01 ☐ X. FIRE CONTROL
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☒ Y. LEACHATE TREATMENT
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

Leachate collected and treated by the Richmond Waste Water Treatment Plant.

01 ☐ Z. AREA EVACUATED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ 1. ACCESS TO SITE RESTRICTED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ 2. POPULATION RELOCATED
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

01 ☐ 3. OTHER REMEDIAL ACTIVITIES
04 DESCRIPTION

02 DATE _____

03 AGENCY _____

N/A

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NUS - Preliminary Assessment dated 6/16/83.
R. Stuart Royer and Associates, Inc. Report dated 10/21/81
Telecon with Buddy Palmare, Director, Collection and Disposal, city of Richmond, dated 4/30/84, phone number (804) 780-6177.

ORIGINAL
(Red)



**POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION**

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
VA	124

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☒ YES ☐ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

On November 28, 1977, the city of Richmond was granted a nonconforming permit to operate the East Richmond Road Landfill. The permit was issued in order to allow a reasonable amount of time for the city to bring the landfill operation into compliance with the rules and regulations of the Virginia State Board of Health. On July 16, 1982, a new solid waste management permit (no. 290) for operating a sanitary landfill was issued to the city of Richmond.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NUS - Preliminary Assessment dated 6/16/83.

ORIGINAL
(Red)

SECTION 6

Site Name: East Richmond Road
TDD No.: F3-8305-38

6.0 LABORATORY DATA

6.1 Sample Data Summary

TDD Number F3-8305-38
 EPA Number 1A-124

SAMPLE DATA SUMMARY
TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name EAST RICHMOND ROAD L.F.
 Date of Sample 6/8/83

Solid sample results reported as
 wet weight.

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected													Remarks
				BIS (2-ETHYLHEXYL) PHTHALATE	DI-N-BUTYL PHTHALATE	NAPHTHALENE	CHLOROBENZENE	BUTYL BENZYL PHTHALATE	DICHLOROETHANE, 1,1-	TRANS-1,2-DICHLOROETHYLENE	TRICHLOROETHYLENE	DIBENZO (A, H) ANTHRAcene	ETHYLBENZENE	VINYL CHLORIDE	DIETHYL PHTHALATE	BENZENE	
3232	WELL #1	AQ	mg/L	0.064	0.006	0.001	<0.01										
3233	WELL #2	AQ	mg/L	0.020	<0.010												
3234	WELL #3	AQ	mg/L	0.013	0.001		0.001	<0.01	0.03	<0.01							
3235	WELL #5	AQ	mg/L	0.033													
3236	WELL #6	AQ	mg/L	0.029	<0.01		<0.01	0.03			<0.01	0.04	<0.01				
3237	WELL #7	AQ	mg/L	0.032	<0.01									<0.01			
3238	WELL #8	AQ	mg/L	0.019	<0.009		<0.009									<0.01	
3240	WELL #10	AQ	mg/L	0.022	<0.01												
3241	PONDED WATER	AQ	mg/L	0.046	<0.01												
3242	BLANK	AQ	mg/L	0.019	<0.01		<0.01										
3244	LEACHATE #1	Sed.	mg/kg	1.9	0.163		0.22				<0.01	<0.01		0.068	0.01		67.6% solid
3245	LEACHATE #2	Sed.	mg/kg	1.7		0.11				<0.01	0.013						79.0% solid
3246	BLANK SOLID	Sed.	mg/kg	0.24	0.027					<0.01		<0.01		0.067	0.03		

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

ORIGINAL
(Red)

TDD Number F3-8305-38
 EPA Number VA-124

**SAMPLE DATA SUMMARY
 TARGET COMPOUNDS**

☒ Organic ☐ Inorganic

Site Name EAST RICHMOND ROAD L.F.
 Date of Sample 6/2/83

Solid sample results reported as
 wet weight.

Compounds Detected

Sample Number	Sample Description and Location	Phase	Units	TETRAHYDROETHYLENE	CHLOROFORM	PHENOL	BIPHENYL	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZ (A)	ANTHRACENE	BENZ (A) PYRENE	BENZ (B)	FLUORANTHENE	BENZ (A)	FLUORANTHENE	BENZ (G,H,I)	PERYLENE	CHRYSENE	2,4-dimethyl phenol	Remarks
C3232	WELL #1	AQ	mg/L																			
C3233	WELL #2	AQ	mg/L																			
C3234	WELL #3	AQ	mg/L																			
C3235	WELL #5	AQ	mg/L																			
C3236	WELL #6	AQ	mg/L																			
C3237	WELL #7	AQ	mg/L																			
C3238	WELL #8	AQ	mg/L																			
C3240	WELL #10	AQ	mg/L	10.01																		
C3241	PONDED WATER	AQ	mg/L																			
C3242	BLANK	AQ	mg/L		<.01																	
C3244	Leachate #1	SOL	mg/kg	0.01		1.1	0.15	0.029	0.079	0.076	1.059	<0.01	0.25	0.504	0.04	0.31						67.6% solid
C3245	Leachate #2	SOL	mg/kg	<0.01	<0.01	0.063			0.12	15	2.6	0.048	0.28	1.0	0.067	0.70	0.018					79.0% solid
C3246	BLANK SOLID	SOL	mg/kg	<0.01																		

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

ORIGINAL
 (Red)

TDD Number F3-8305-38
 EPA Number VA-124

SAMPLE DATA SUMMARY
 TARGET COMPOUNDS

☒ Organic ☐ Inorganic

Site Name EAST RICHMOND ROAD C.F.
 Date of Sample 6/2/83

Solid sample results reported as
 wet weight.

Compounds Detected

Solid sample results reported as wet weight.																
Sample Number	Sample Description and Location	Phase	Units	DICHLOROBENZENE 1,2	DICHLOROBENZENE 1,4	DIOCTYL PHTHALATE	FLUORANTHENE	INDENO (1,2,3-cd) PYRENE	PHENANTHRENE	PYRENE	TOLUENE	N-VINYL-2-METHYLANILINE	4,4'-DDE	HEPTACHLOR	PCB-1260	Remarks
C3232	WELL #1	AQ	mg/L													
C3233	WELL #2	AQ	mg/L													
C3234	WELL #3	AQ	mg/L													
C3235	WELL #5	AQ	mg/L													
C3236	WELL #6	AQ	mg/L													
C3237	WELL #7	AQ	mg/L													
C3238	WELL #8	AQ	mg/L													
C3240	WELL #10	AQ	mg/L													
C3241	PONDGO WATER	AQ	mg/L													
C3242	BLANK	AQ	mg/L													
C3244	Leachate #1	Sol.	mg/kg	0.021	0.029	0.482	0.57	0.033	0.242	0.55	20.01				0.61	67.6% solid
C3245	Leachate #2	Sol.	mg/kg				77	0.058	50	75		0.035			0.33	79.0% solid
C3246	BLANK SOLID	Sol.	mg/kg								0.01		0.0020	<0.0020		

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

Original
 File

Lab Number FD 8300-3811
 EPA Number VA-124

SAMPLE INFORMATION
 MRG MPG
☐ Organic ☒ Inorganic

Site Name East Richmond Rd L.F.
 Date of Sample 6/8/83

Sample Number	Sample Description and Location	Phase	Units	Compounds Detected													Remarks
				Aluminum	Chromium	Barium	Beryllium	Cobalt	Copper	Iron	Nickel	Manganese	Zinc	Boron	Vanadium	Silver	
MC0910	Well #1	Aq.	mg/L	180	0.045	1.9	0.011	0.096	0.70	370	0.19	1.5	0.20	0.8	0.7	0.002	
MC0911	Well #2	Aq.	mg/L	0.50		0.16		0.006	0.032	9		0.26	0.10	0.2			
MC0912	Well #3	Aq.	mg/L	180	0.42	2.8	0.014	0.11	0.36	330	0.16	6.1	1.2	0.6	1.7	0.003	
MC0913	Well #5	Aq.	mg/L	4.4	0.018	0.74		0.022	0.11	22	0.04	0.66	0.18	0.3			
MC0914	Well #6	Aq.	mg/L	0.81	0.010	0.78		0.018	0.022	31	0.02	0.81	0.064	0.3			
MC0915	Well #7	Aq.	mg/L	42	0.35	0.38	0.016	0.054	0.16	350	0.14	5.0	0.40	0.4	0.2	0.002	
MC0916	Well #8	Aq.	mg/L	1.4	0.008	0.17		0.022	0.024	5	0.03	0.17	0.025	0.3		0.002	
MC0918	Well #10	Aq.	mg/L	310	1.1	1.8	0.021	0.15	0.56	860	0.56	5.3	1.8	0.4	0.6		
MC0919	Ponded Water	Aq.	mg/L	0.92	0.006	0.11		0.006	0.009	1		0.016	0.45	0.1			
MC0920	Blank	Aq.	mg/L	0.04				0.004	0.007		0.01		0.093	0.1			
MC0922	Leachate #1	Sed.	mg/Kg	12000	49	130		7	63	40000	13	200	440	6.6	40	2.7	
MC0923	Leachate #2	Sed.	mg/Kg	9900	35	58		6	42	26000	9.7	160	150	1.6		1.2	
MC0924	Blank (Solid)	Sed.	mg/Kg														

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

ORIGINAL
(Red)

TDD Number F3-8305-38A
 EPA Number VA-124

...LL...SL...Y
 TARGET COMPOUNDS

☐ Organic ☒ Inorganic

Site Name East Richmond Rd L.F.
 Date of Sample 6/8/83

Compounds Detected

Sample Number	Sample Description and Location	Phase	Units	Arsenic	Antimony	Selenium	Thallium	Mercury	Tin	Cadmium	Lead	Ammonia	Cyanide	Sulfide	Remarks
MC0910	Well #1	Aq	mg/L	0.045	0.03		0.15	0.0020	0.37	0.020	0.89				
MC0911	Well #2	Aq	mg/L						0.12	0.023					
MC0912	Well #3	Aq	mg/L	0.015			0.22	0.0004	0.42	0.017	0.28				
MC0913	Well #5	Aq	mg/L	0.003			0.11	0.0003	0.11	0.008	0.02				
MC0914	Well #6	Aq	mg/L				0.11		0.18	0.008					
MC0915	Well #7	Aq	mg/L	0.018			0.14		0.41	0.024	0.011				
MC0916	Well #8	Aq	mg/L				0.03		0.15	0.011					
MC0918	Well #10	Aq	mg/L	0.12			0.46	0.0010	0.81	0.026	0.98				
MC0919	Ponded Water	Aq	mg/L				0.03		0.04	0.006		0.01			
MC0920	Blank	Aq	mg/L						0.04	0.006					
MC0922	Leachate #1	Sed	mg/kg	4.6			14	0.5	64		200				
MC0923	Leachate #2	Sed	mg/kg	7.8			10	0.2			120				
MC0924	Blank (Solid)	Sed	mg/kg												

NOTE: For a review of this data and non-target, tentatively identified compounds, please see the Analytical Quality Assurance section of this report.

◇ Denotes results of questionable qualitative significance based upon quality assurance review of data.

ORIGINAL
 (Red)

6.2 Quality Assurance Review

6.2.1 Organic Data: Lab Case 1794

6.2.1.1 Introduction

The findings offered in this report are based upon a general review of all laboratory data generated by a subcontract laboratory which performed analysis for organic priority pollutants, according to the requirements outlined in NUS Internal Correspondence Number C-585-6-3-24. Blank results, surrogate and matrix spike recoveries, duplicate analysis results, G.C. confirmations and target compound matching quality were examined in detail.

6.2.1.2 Qualifiers

It is recommended that this data package be utilized only with the following qualifier statements:

- o All positive results for bis (2-ethylhexyl) phthalate, di-n-butyl phthalate, butyl benzyl phthalate, diethyl phthalate, trichloroethene, ethylbenzene, benzene, tetrachloroethene, chloroform and toluene may be questionable.
- o The result for di-octyl phthalate in sample C-3244 may be questionable.
- o The result for n-nitrosodimethylamine in sample C-3245 may be questionable.
- o The reported result for trans-1,2-dichloroethene in sample C-3234 is incorrect and actually represents the presence of cis-1,2-dichloroethene.
- o Actual levels of VOA compounds in sample C-3234 may be slightly higher than reported.
- o Actual levels of acenaphthylene may be slightly higher than reported in sample C-3244.

- o Detection limits for benzidine in sample C-3232 may be slightly higher than that reported. Additionally, in sample C-3244 the detection limit for benzidine may be significantly higher than that reported.
- o Detection limits for 2,4-dimethylphenol, 2,4-dichlorophenol, 2-nitrophenol, p-chloro-m-cresol, nitrobenzene, n-nitroso-n-propyl-propanamine, 2-chloronaphthalene and dimethyl phthalate may be slightly higher than reported in sample C-3244.
- o Detection limits for p,p'-DDT and beta-endosulfan may be slightly higher than those reported for sample C-3232.
- o Actual values for PCB-1260 may differ significantly from those reported.
- o The reported value for benzo-(k)-fluoranthene in sample C-3244 may not reflect the average concentration of this constituent.
- o BNA compound detection limits for solid samples are actually 10 times higher than those reported. Additionally, all reported BNA compounds in solid samples, at concentrations less than .5 mg/kg, are considered approximate values.
- o Tentatively identified compounds were reported by the laboratory but are not included in this report.

6.2.1.3 Findings

- o Bis (2-ethylhexyl) phthalate, di-n-butyl phthalate, butyl benzyl phthalate, diethyl phthalate, trichloroethene, ethylbenzene, benzene, tetrachloroethene, chloroform and toluene were detected in field and/or laboratory blanks at levels sufficient to question the aforementioned sample results.
- o The presence of di-octyl phthalate in sample C-3244 is questioned because this compound is a common laboratory contaminant, and was found at less than detection limits.

- o Results for sample C-3245 did not include spectra for n-nitrosodimethylamine, phenol and 2,4-dimethylphenol. Additionally, sample C-3244 did not include spectra for phenol. It is expected that receipt of these spectra will verify the presence of the acid compounds. However, examination of available raw data suggests that the reported result for n-nitrosodimethylamine in sample C-3245 may be an artifact of a computer misidentification which was not carefully reviewed by the laboratory.
- o The relative retention time of 1,2-dichloroethene in sample C-3234 does not match that of the trans-isomer in the standard. Thus, the spectrum match indicates the presence of the cis-isomer in this sample.
- o Surrogate spike recoveries for VOA compounds in sample C-3234 were very low.
- o Matrix spike recovery for benzidine was very low in sample C-3232 and was zero in sample C-3244.
- o The matrix spike compounds: 2,4-dimethyl phenol, 2,4-dichlorophenol, 2-nitrophenol, p-chloro-m-cresol, n-nitroso-n-propyl-1-propanamine, 2-chloronaphthalene, dimethyl phthalate, nitrobenzene and acenaphthylene exhibited very low recoveries in sample C-3244.
- o Sample C-3232 exhibited very low matrix spike recoveries for p,p'-DDT and beta-endosulfan.
- o The pesticide analysis narrative report states that due to numerous sulfur treatments and low extract volumes, quantitation could not be accurately performed for PCB 1260.
- o Duplicate analysis results for benzo(k)fluoranthene in sample C-3244 revealed a high relative percent difference for this compound.

Site Name: East Richmond Road
TDD No.: F3-8305-38

- o The reported solid sample BNA detection limits were not calculated from the correct extract concentration factor. Since the correct detection limit values are .1 mg/kg, reported results less than this detection limit should only be considered approximate.
- o Per EPA request, tentatively identified compounds were examined only for possible target compound identifications.

6.2.1.4 Summary

The attached Quality Assurance Review has identified the aforementioned areas of concern. The analysis lab has been requested to submit the missing target compound spectra for samples C-3244 and C-3245. Please see the accompanying Support Documentation Appendix for specifics on this Quality Assurance Review.

Report prepared by Atwood F. Davis  Date: May 2, 1984

6.2.2 Inorganic Data: Lab Case 1794

6.2.2.1 Introduction

The findings offered in this report are based upon a general review of all available inorganic laboratory data generated by a subcontract laboratory, which performed the analyses according to requirements outlined by NUS Internal Correspondence Number C-585-6-3-24. Blank analysis results, matrix spike recoveries, duplicate analysis results and reported detection limits were examined from laboratory tabulated report sheets.

6.2.2.2 Qualifiers

It is recommended that this data package be utilized only with the following qualifier statements:

- o All aqueous sample results for cadmium and antimony may be questionable.
- o All aqueous sample results for zinc and boron may be questionable, except for zinc in samples MC-0912 and MC-0918 and for boron in sample MC-0919.
- o The results for cobalt in samples MC-0911, MC-0914 and MC-0919 may be questionable.
- o The results for copper in samples MC-0911, MC-0914, MC-0916 and MC-0919 may be questionable.
- o The results for nickel in samples MC-0913, MC-0914 and MC-0916 may be questionable.
- o The results for tin in samples MC-0911, MC-0913, MC-0914, MC-0916 and MC-0919 may be questionable.

- o Several EPA contractual required detection limits were not met by the laboratory. Solid samples detection limits were not met for lead, mercury and tin. Aqueous sample detection limits were not met for iron, thallium and tin.
- o Detection limits for selenium may be significantly higher than those reported.

6.2.2.3 Findings

- o Cadmium, antimony, zinc, boron, cobalt, copper, nickel and tin were detected in field and/or laboratory blanks at levels sufficient to question the aforementioned sample results.
- o Required detection limits not met and reported detection limits are listed below:

<u>Matrix</u>	<u>Parameter</u>	<u>Reported</u>	<u>Required</u>
Solid	Lead	3 mg/kg	0.5 mg/kg
	Mercury	0.1 mg/kg	0.02 mg/kg
	Tin	20 mg/kg	2 mg/kg
Aqueous	Iron	1 mg/kg	0.05 mg/L
	Thallium	0.02 mg/L	0.01 mg/L
	Tin	0.06 mg/L	0.02 mg/L

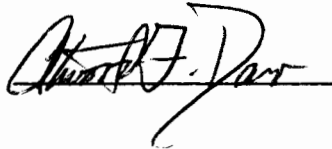
- o Selenium exhibited a matrix spike recovery of zero for both the aqueous and solid sample spikes.

Site Name: East Richmond Road
TDD No.: F3-8305-38

6.2.2.4 Summary

The attached Quality Assurance Review has identified blank contamination, poor matrix spike recoveries, and the inability of the laboratory to meet required detection limits as the primary areas of concern. However, these samples were analyzed under a older subcontract which did not require the laboratory to supply any raw data. Consequently, this review has been limited to evaluation of the laboratory's sample report summaries and tabulated matrix spike recoveries. In particular, it was not possible to examine the laboratory's raw data for possible artifacts due to carryover effects, calculation errors, transcription errors unreported contaminants, verification of standard linearity and calibration check standards. Please see the attached Support Documentation Appendix for specifics on this Quality Assurance Review.

Report prepared by Atwood F. Davis

Date: April 28, 1984

ORIGINAL
(Red)

SECTION 7

7.0 TOXICOLOGICAL EVALUATION

7.1 Summary

Groundwater samples from beneath the East Richmond Road landfill revealed substantial concentrations of toxic heavy metals lead and chromium in 3 monitoring wells. The concentrations of lead reported in these wells could lead to overt signs of plumbism if water from these wells were to be consumed over an extended period of time. Other heavy metals and toxic contaminants such as thallium, mercury, barium, and arsenic were reported in one or more monitoring wells at potentially toxic concentrations. Trace levels of known and suspected carcinogens such as vinyl chloride and dibenzo(a,h)anthracene were also reported in monitoring well samples. Reported concentrations of heavy metals were sufficiently high to possibly preclude future potable use of groundwater beneath the site. Note that local residents receive their water from the city of Richmond.

Two leachate samples revealed the presence of notable levels of lead and thallium. The common urban contaminants, polynuclear aromatic hydrocarbons, were reported in both leachate samples. Low levels of the toxic and biocumulative contaminant, PCB 1260, were also reported.

7.2 Support Data

Measurable concentrations of toxic contaminants such as lead, thallium, chromium, and barium were each reported in several sampled monitoring wells (MW). Lead was reported in MWs 1, 3, and 10 at concentrations of 890, 280, and 980 ug/l, respectively, far exceeding Maximum Contaminant Levels (MCL) of 50 ug/l set for public water supplies. Chromium was reported at concentrations exceeding the MCL of 50 ug/l in MWs 3 (420 ug/l), 7 (350 ug/l), and 10 (1,100 ug/l). Reported thallium concentrations ranged from 30 to 460 ug/l, exceeding recommended criteria for the protection of human health in potable water of 13 ug/l in 7 of 8 monitoring wells sampled. Reported barium concentrations (1,800 to 2,800 ug/l) exceeded the MCL of 1,000 ug/l in MWs 1, 3, and 10. Mercury was reported in MW 1 at a concentration of 2 ug/l, equalling the MCL.

Lead at the highest reported concentration (980 ug/l) may be decidedly toxic and may produce renal impairment as well as CNS effects such as irritability, headaches, loss of memory, muscle tremor, and ataxia if consumed over extended periods of time. The reported concentrations of lead would be even more hazardous to children who are particularly susceptible to the toxic effects of this metal.

The nature of chromium in MWs (chromium III or VI) cannot be ascertained from current data. Although hexavalent chromium has long been recognized as a toxic and carcinogenic substance, trivalent chromium is considered by most investigators to be relatively innocuous and even essential to human health in microgram amounts. The MCL for chromium in public water supplies has been set at 50 ug/l (total chromium) and is thought to provide an adequate margin of safety due to the poor absorption of chromium from the gastrointestinal tract. Humans have reportedly consumed from 1,000 to 25,000 ug/l chromium in drinking water for periods of up to 3 years without known effects on health (Davids and Lieber, 1951)*. The weight of evidence from human and animal studies also suggests no carcinogenic response from ingested chromium.

An acceptable daily thallium intake (ADI) of 37.1 ug has been recommended for man (U.S. EPA, 1980). This criterion incorporates a safety factor of 1,000 due to a lack of long term or acute human data. The thallium induced toxic effect to which man is most sensitive is believed to be alopecia, which may occur following ingestion of 3,100 to 7,800 ug thallium per kg body weight (Munch, 1934). Note that the reported MW thallium concentrations exceed the ADI, but still fall within the 1,000-fold safety factor.

Ingestion of soluble barium salts may pose increased risks for persons with a history of heart disease; however, the average daily human intake of barium is 16 mg, well above the concentrations reported in the East Richmond Road landfill monitoring wells.

* Davids, H.W., and Lieber, M. 1951. underground water contamination by chromium wastes. Water Sewage Works 98: 528-534.

Beryllium, arsenic, vinyl chloride, and dibenz(a,h)anthracene, potential or known human carcinogens, were also reported in several monitoring wells at concentrations ranging from 11 to 21 ug/l (Be), 3 to 45 ug/l (As), and less than 10 ug/l (vinyl chloride and dibenz(a,h)anthracene). Theoretical long-term consumption of water contaminated with the reported concentrations of these contaminants may result in an increased carcinogenic risk. Note that the concentration of arsenic reported in MW 1, 45 ug/l, approaches the MCL of 50 ug/l.

A low level (30 ug/l) of the chlorinated solvent, 1,1-dichloroethane (1,1-DCE) was reported in MW 6. While insufficient information is available to determine whether 1,1-DCE is carcinogenic, note that a related compound, 1,2-dichloroethane, has been associated with cancer in laboratory rodents. The aesthetically objectionable metals iron and manganese were also reported at excessive levels, 5,000 to 860,000 ug/l (Fe) and 170 to 6,100 ug/l (Mn), in all sampled wells.

Groundwater in the vicinity of the landfill is believed to flow south towards the Gillies Creek channel. While no information on the current quality of Gillies Creek water is available, note that the creek flows in a concrete channel, which may provide an effective barrier to groundwater flow.

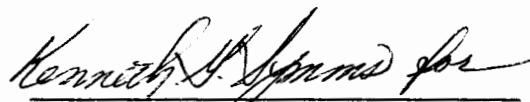
Two leachate seeps sampled on site revealed the presence of lead at concentrations of 120 to 200 mg/kg, in excess of average lead concentrations generally reported in non-polluted soils of 15 mg/kg (range 2 to 200 mg/kg). Thallium, generally reported in natural soil at a concentration of 1 mg/kg, was reported in both leachate seeps at a concentration of 10 to 14 mg/kg. Sorption of lead and thallium to soil particles appears to be the dominant mechanism controlling the fate of these heavy metals in the environment. At low pH values, sorption is apparently not as effective as it is at neutral or even alkaline pH.

Leachate samples also revealed the presence of the common urban contaminant, polynuclear aromatic hydrocarbons (PAH). Leachate sample no. 2 revealed about 222 mg/kg PAHs, significantly higher than the concentration reported in leachate sample no. 1 (about 3.8 mg/kg).

PAHs are commonly found in coal tars and creosotes. Potentially carcinogenic PAHs such as benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene were reported in both leachate samples. The reported concentrations of these potentially carcinogenic contaminants were generally low, on the order of about 0.01 to 1.06 mg/kg. PAHs adsorb to soil particles suggesting that the reported PAH concentrations should not pose substantial threats to human health via likely routes of exposure. More acute effects such as photosensitization or irritation, associated with direct contact with high concentrations of PAHs, also would not be expected in this case.

Low levels of PCB 1260 were reported in both leachate samples at concentrations of 0.61 and 0.33 mg/kg. PCBs are persistent, highly bioaccumulative, and potentially carcinogenic chlorinated hydrocarbons. The reported PCB concentrations are well below the maximum soil concentration criterion set in the PCB regulations of 50,000 ug/kg (a "safe" level of PCBs in soil has not yet been determined). The extent of potential PCB contamination cannot be determined from available data. PCBs strongly bind to soil elements, thus reducing the concentration available for absorption should direct contact occur. The low concentrations of PCBs reported in current samples should not, therefore, pose substantial threats to human health via likely routes of exposure.

An aqueous sample of ponded water on the landfill site revealed no organic or inorganic contaminants at concentrations of concern.


Elizabeth Quinn, Toxicologist

ORIGINAL
(Red)

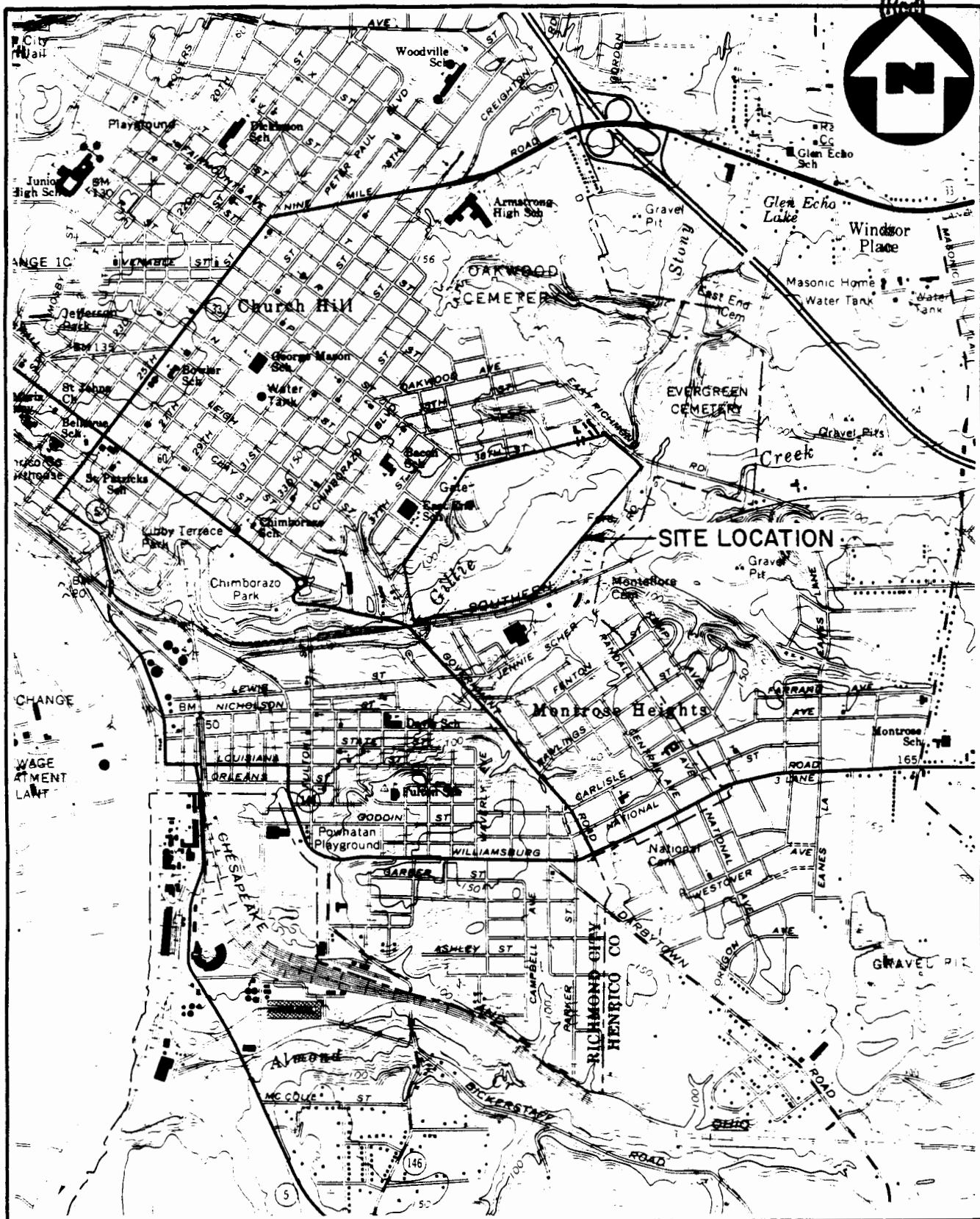
APPENDIX A

Atlanta
(Red)

1. COST CENTER:	REM/FIT ZONE CONTRACT TECHNICAL DIRECTIVE DOCUMENT (TDD)			2. NO.:
ACCOUNT NO.:				F3-8305-38A
3. PRIORITY:	4. ESTIMATE OF TECHNICAL HOURS:	5. EPA SITE ID:	6. COMPLETION DATE:	7. REFERENCE INFO.:
<input type="checkbox"/> HIGH <input checked="" type="checkbox"/> MEDIUM <input type="checkbox"/> LOW	* 135 w/o/ HRS * 155 with HRS	VA-124		<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> ATTACHED <input type="checkbox"/> PICK UP See NUS P.A.
	4A. ESTIMATE OF SUBCONTRACT COST:	5A. EPA SITE NAME:		
		East Richmond Road	3 wks after QA	
8. GENERAL TASK DESCRIPTION: <u>Conduct a Site Inspection and HRS as necessary.</u>				
9. SPECIFIC ELEMENTS: <ul style="list-style-type: none"> 1.) <u>Review P.A. prepared by NUS FIT III.</u> 2.) <u>Prepare a sampling plan and submit to EPA for approval.</u> 3.) <u>Coordinate site activities with State.</u> 4.) <u>Conduct on-site sampling and inspection and off-site sampling as appropriate.</u> 5.) <u>Coordinate Lab needs thru VIAR.</u> 6.) <u>Follow chain of custody.</u> 7.) <u>Submit formal report.</u> 				10. INTERIM DEADLINES: <div style="border-bottom: 1px solid black; height: 10px; width: 100%;"></div> <div style="border-bottom: 1px solid black; height: 10px; width: 100%;"></div> <div style="border-bottom: 1px solid black; height: 10px; width: 100%;"></div> <div style="border-bottom: 1px solid black; height: 10px; width: 100%;"></div> <div style="border-bottom: 1px solid black; height: 10px; width: 100%;"></div> <div style="border-bottom: 1px solid black; height: 10px; width: 100%;"></div> <div style="border-bottom: 1px solid black; height: 10px; width: 100%;"></div>
11. DESIRED REPORT FORM: FORMAL REPORT <input type="checkbox"/> LETTER REPORT <input type="checkbox"/> FORMAL BRIEFING <input type="checkbox"/>				
OTHER (SPECIFY): <u>If no HRS- 135 hours.</u>				
12. COMMENTS: <u>* Ammendment due to additional hours required to sub contract for Laboratory analysis.</u>				
13. AUTHORIZING RPO: <u>Harold G. Byer</u> <div style="text-align: center;">(SIGNATURE)</div>			14. DATE: <u>2/02/84</u>	
15. RECEIVED BY: <u>[Signature]</u> <div style="text-align: center;"> <input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> ACCEPTED WITH EXCEPTIONS <input type="checkbox"/> REJECTED (CONTRACTOR RPM SIGNATURE) </div>			16. DATE: <u>2/7/84</u>	

ORIGINAL
(Red)

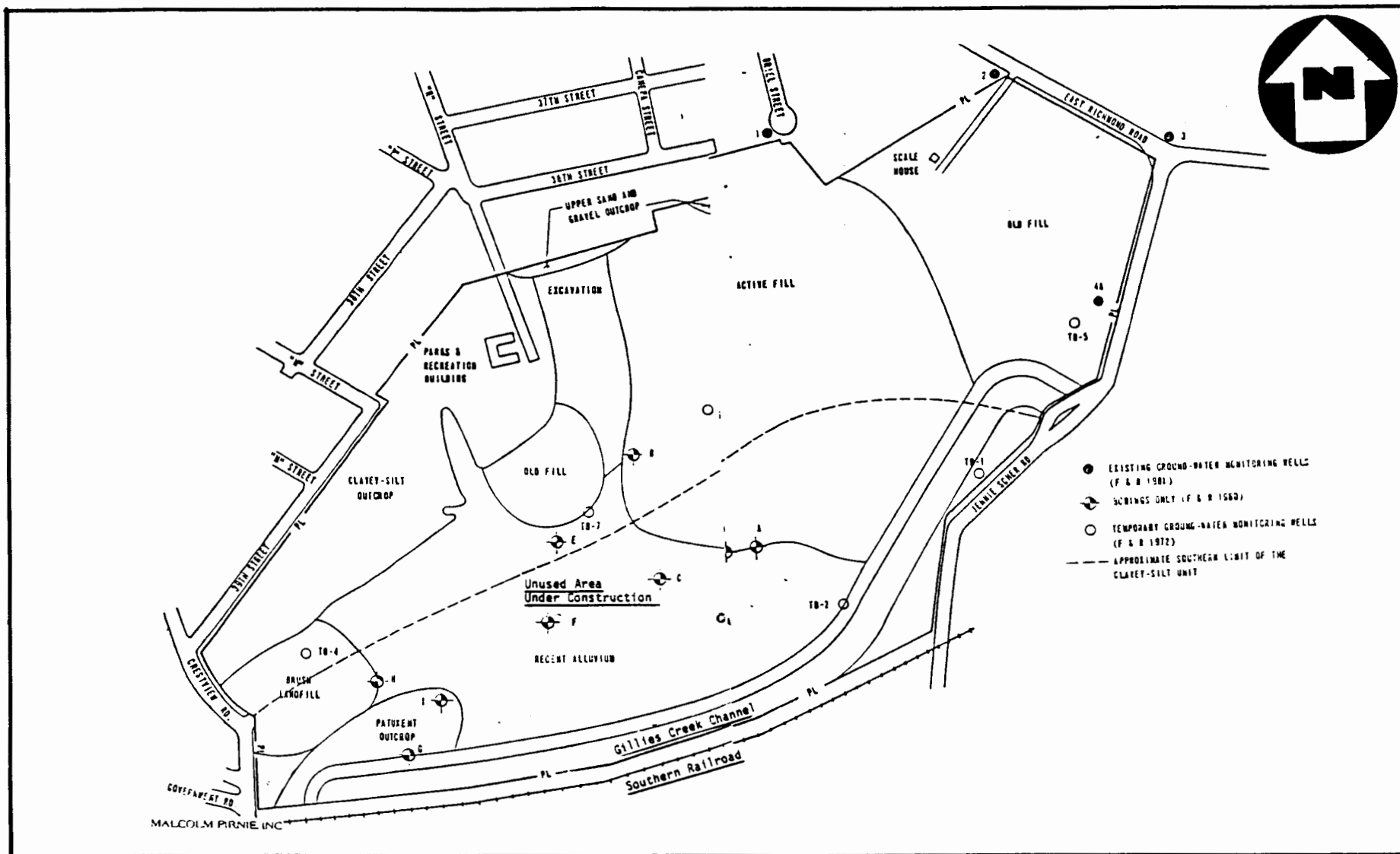
APPENDIX B



SOURCE: USGS RICHMOND VA. QUAD. (7.5 MINUTE SERIES)

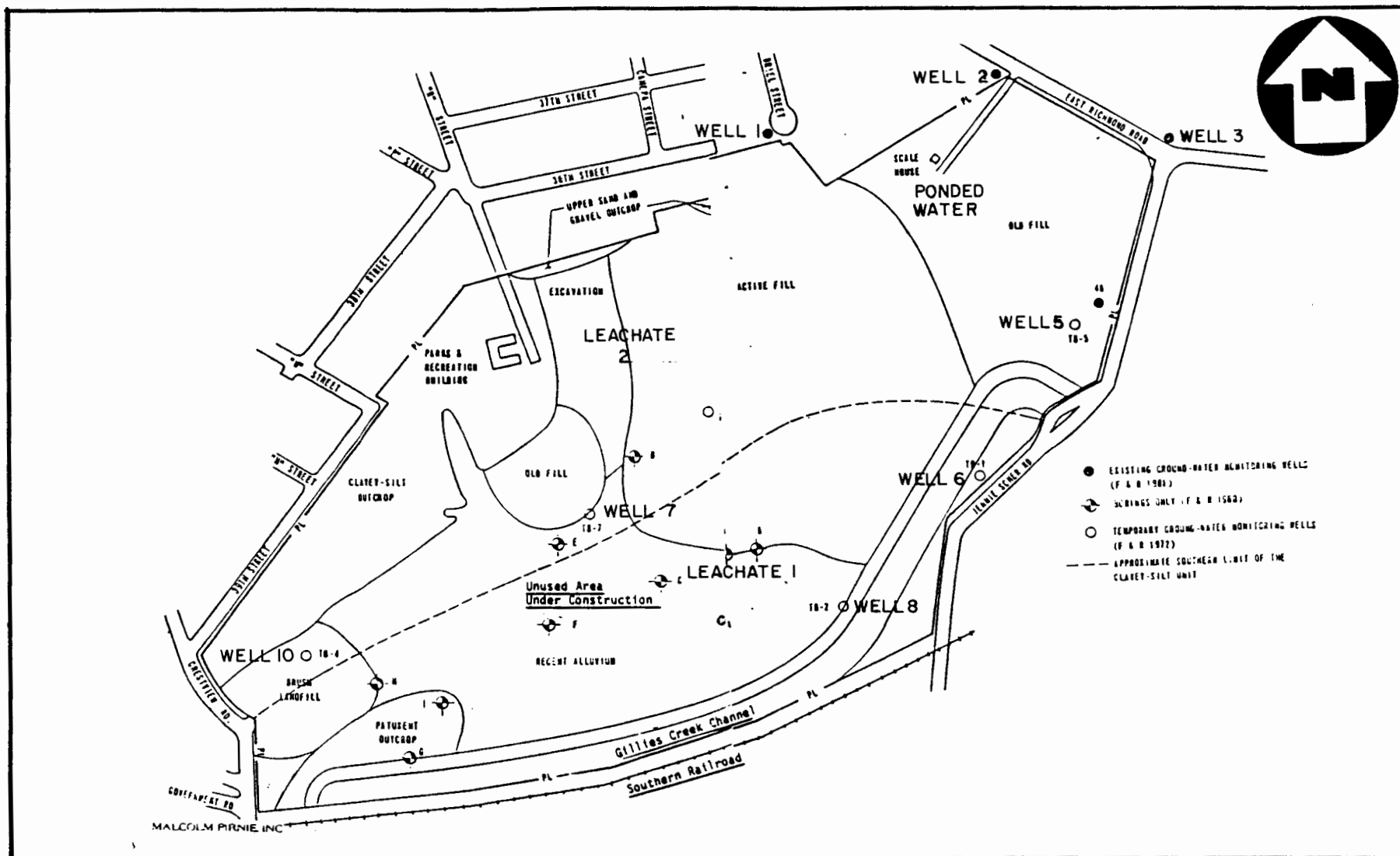
FIGURE 1

SITE LOCATION MAP
EAST RICHMOND RD. LANDFILL, RICHMOND, VA.
 SCALE 1:24000



SITE SKETCH
EAST RICHMOND RD. LANDFILL, RICHMOND, VA.
(NO SCALE)

FIGURE 2



SAMPLE LOCATION MAP
EAST RICHMOND RD. LANDFILL, RICHMOND, VA.
 (NO SCALE)

FIGURE 3

APPENDIX C

PROJECT NAME: EAST RICHMOND ROAD
TDD NO: F3-8305-38

EPA SITE NO.: VA-124
REGION: III

QUALITY ASSURANCE REVIEW OF
ORGANIC ANALYSIS LAB DATA PACKAGE

ORIGINAL
(Red)

Case No.: 1794 Applicable Sample No's.: C-3232 through AND
Contract No.: _____ INCLUDING C-3238, C-3240, C-3241, C-3242,
Contract Laboratory: ERG (AS SUBCONTRACTOR) C-3244, C-3245 and C-3246
Applicable IFB No.: NOT APPLICABLE [1]
Reviewer: Atwood F. Davis
Review Date: 4-28-84

The organic analytical data for this case has been reviewed. The quality assurance evaluation is summarized in the following table:

Reviewer's Evaluation*	Fraction				
	VOLATILES	ACIDS	BASE/ NEUTRALS	PCB/ PEST.	TCDD
Acceptable					✓
Acceptable with exception(s)	✓ 2,3	✓ 4,5	✓ 2,4,5,6	✓ 4,5,7	
Questionable					
Unacceptable					

* Definitions of the evaluation score categories are listed on next page.

This evaluation was based upon an analysis of the review items indicated below:

- DATA COMPLETENESS
- BLANK ANALYSIS RESULTS
- SURROGATE SPIKE RESULTS
- MATRIX SPIKE RESULTS
- DUPLICATE ANALYSIS RESULTS
- EVALUATION OF CONFIRMATIONS
- QUANTITATIVE CALCULATIONS
- TARGET COMPOUND MATCHING QUALITY
- TENTATIVELY IDENTIFIED COMPOUNDS
- CHROMATOGRAPHIC SENSITIVITY CHECKS
- DFTPP AND BFB SPECTRUM TUNE RESULTS
- STANDARDS
- CALIBRATION CHECK STANDARDS
- INTERNAL STANDARDS PERFORMANCE

Data review forms are attached for each of the review items indicated above.

≠ No errors noted, no form attached.

● Spot Check performed.

Comments: [1] See INTERNAL CORRESPONDENCE C-585-6-3-24 Re: SUBCONTRACT REQUIREMENTS
INCLUDED AT THE END OF THIS APPENDIX.

[1] See blank analysis results.

[3] See surrogate spike recoveries.

[4] See matrix spike recoveries.

[5] See quantitative calculations.

[6] See duplicate analysis results.

[7] See Evaluation of GC confirmations and comments.

DATA EVALUATION SCORE CATEGORIES

ORIGINAL
(Red)

ACCEPTABLE: Data is within established control limits, or the data which is outside established control limits does not affect the validity of the analytical results.

ACCEPTABLE WITH EXCEPTION(S): Data is not completely within established control limits. The deficiencies are identified and specific data is still valid, given certain qualifications which are listed below.

QUESTIONABLE: Data is not within established control limits. The deficiencies bring the validity of the entire data set into question. However, the data validity is neither proved nor disproved by the available information.

UNACCEPTABLE: Data is not within established control limits. The deficiencies imply the results are not meaningful.

DATA COMPLETENESS		CONC./MATRIX												
			→ Lg/50c →											
FRACTION	TRAFFIC REPORT # C	3232	3233	3234	3235	3236	3237	3238	3240	3241	3242	3244	3245	
	LAB I.D. # 909	18	21	22	23	24	25	26	27	28	29	30	33	
BNA :	RUN DATE/TIME [1]													
	TARGET COMPOUND TAB.	✓												
	TARGET COMPOUND D.L.	✓												
	TENT. I.D. COMPOUND TAB.	✓												
	SURROGATE RECOVERY	✓												
	CALCULATION VOLUMES	✓												
	GC/MS CHROMATOGRAMS	✓												
	TARGET CMPD. QUAN. LIST	✓												
	TARGET CMPD. SPECTRA	✓												
	TENT. I.D. CMPD. Q.L.	✓												
	TENT. CMPD. LIB. SRCH.	✓												
	CHRO./SENS. CHECKS	MS												
	BFB/OTPP TUNE DATA	16:06	13:15	12:45	11:15	11:35								
	STD. CHROMATOGRAMS	MS												
	STD. QUAN. LIST	MS												
	SAMPLE/FIELD BLANK										✓			
METHOD/INSTR. BLANK	✓41										✓42			
LAB DUPLICATE	✓19										✓31			
FIELD DUP/REP														
MAT. SPK./M. STD.	✓20										✓32			
PEST. :	PESTICIDE TABULATION	✓												
	PEST. D.L. TABULATION	✓												
	PESTICIDE CHRO.	✓												
	PESTICIDE STD. CHRO.	✓												
	CALCULATION VOLUMES	✓												
	2nd COLUMN CONF.	✓												
	GC/MS CONFIRMATION	NA												
	PESTICIDE DUPLICATE	✓												
	PESTICIDE SPIKE	✓												
PESTICIDE BLANK										✓				
TCDD	TCDD TABULATION	✓												
	TCDD DETECTION LIMIT	✓												
	TCDD CHRO./E.I.C.P.	✓												
	TCDD BLANK													

DATA COMPLETENESS		CONC./MATRIX	Lo/AA										Lo/SOL	
FRACTION	TRAFFIC REPORT # C		3232	3233	3234	3235	3236	3237	3238	3240	3241	3242	3244	3245
	LAB I.D. # 909		18	21	22	23	24	25	26	27	28	29	30	33
VOA :	RUN DATE/TIME [1]													
	TARGET COMPOUND TAB.	✓												
	TARGET COMPOUND D.L.	✓												
	TENT. I.D. COMPOUND TAB.	✓												
	SURROGATE RECOVERY	✓												
	CALCULATION VOLUMES	✓												
	GC/MS CHROMATOGRAMS	✓												
	TARGET CMPD. QUAN. LIST	✓												
	TARGET CMPD. SPECTRA	✓												
	TENT. I.D. CMPD. Q.L.	✓												
	TENT. CMPD. LIB. SRCH.	✓												
	CHRO./SENS. CHECKS	N/A												
	BFB/DFTPP TUNE DATA		11:12:00	12:0:33	12:16:30	13:8:40	13:20:30	14:9:20						
	STD. CHROMATOGRAMS	✓												
	STD. QUAN. LIST	✓												
	SAMPLE/FIELD BLANK											✓		✓
	METHOD/INSTR. BLANK	✓41											✓42	
	LAB DUPLICATE	✓19											✓31	
	FIELD DUP/REP													
	MAT. SPK./M. STD.	✓20											✓32	

COMMENTS: [1] See RUN CHRONICLE, NEXT PAGE.

KEY TO DATA COMPLETENESS FORM

Abbreviation Used on Form

Description of Checklist Item

Conc./Matrix	Concentration category submitted in analysis request (low, med, hi); and matrix (sol., aq.)
Fraction	Fill in acid, base/neutral, acid/base/neutral, or volatiles analysis
Run Date/Time	Instrument run date (to be used for correlating calibration)
Target Cmpd. Tab.	Tabulated results for target compounds
Target Cmpd. D.L.	Detection limits for target compounds (actual/level indicated by screen)
Tent. ID. Cmpd. Tab.	Tabulated results for tentatively identified compounds
Surr. Rec.	Surrogate recoveries results
GC Screen Tab.	Tabulated GC screen results indicating required level of followup
GC/MS Chromatograms	Chromatograms of GC/MS analysis runs
Target Cmpd. Quan. List	Target compounds quantitation list, showing areas, ret. times
Target Cmpd. Spectra	Enhanced and unenhanced spectra of target compound hits
Tent. ID. Cmpd. Q.L.	Quantitation list for tentatively identified compounds
Tent. Cmpd. Lib. Srch.	Spectra and library match spectra of tentatively identified compounds
Chro./Sens. Checks	EICP's and R.R.F.'s for chromatographic sensitivity checks
BFB/DFTPP Tune Data	Spectra intensity lists, and criteria comparison forms for BFB, DFTPP
I.S. Areas Charts	Internal standards area control charts and description of remedial action
I.S. Rel. Resp. Form	Internal standards relative response listings for each sample run
RF and amts.: Calib. Chk.	Tabulated response factors and amount injected for all cmpds. in calibration check
RF and amts.: 3-Pt. Calib.	Tabulated response factors and amount injected for all cmpds. in 3-point calibration
Chromatograms: Calib. Chk.	Chromatograms for calibration check standard
Chromatograms: 3-Pt. Calib.	Chromatograms for 3-point multilevel calibration standards.
Linearity: 3-Pt. Calib.	Tabulated correlation coefficient or relative standard deviation for calibration
RF Comparison	Tabulated comparison of calibration Response Factor with check standard
Sample/Field Blank	Equipment rinse or reagent water blank shipped with samples from field
Method/Instr. Blank	Method or instrument blank which is prepared at lab
Lab Duplicate	Sample which was split by lab for duplicate analysis
Field Dup/Rep	Sample which was split or collected twice in the field
Mat. Spk./M. Std.	Matrix spike or method standard (blind, or done by lab)
Pest. Tab.	Tabulated results for pesticides
Pest. D.L. Tab.	Tabulated detection limits for pesticides
Pest. Chro.	Chromatograms for pesticide screening
2 nd Col. Conf.	Confirmation of pesticide results by using a second GC column and temperature
GC/MS Conf.	Confirmation of pesticide results by GC/MS analysis
Pest. Dup., Spk. Blk.	Pesticide duplicate, spike, and blank
Pest. Std. Chro.	Chromatogram of pesticide standard
Pest. Std. ID.	Pesticide standard identification form
TCDD	2,3,7,8-tetrachlorodibenzodioxin
TCDD Tab., D.L., EICP, Blk.	TCDD tabulated results, detection limits, extracted ion current profile, blank

KEY TO SYMBOLS USED IN DATA COMPLETENESS TABLE

Symbol

Meaning

✓

Data item present

NA

Data item not applicable or not required

P

Data item within established control limits

F

Data item outside established control limits

MS

Missing item

Symbol

Meaning

I

Incomplete data item

NC

Data item not clearly explained
(units of conc., etc)

* or [number]

See footnote

XX/XX/XX XX:XX Date/Time of run (calibration, etc.)

RUN CHRONICLE

FRACTION: VOA			FRACTION:			FRACTION: BNA		
RUN ORDER	RUN ID / DESCRIPTION	DATE / TIME	RUN ORDER	RUN ID / DESCRIPTION	DATE / TIME	RUN ORDER	RUN ID / DESCRIPTION	DATE / TIME
2	VPP(STD) 611B	6/11 12:45	1	BFB	6/11 12:00		C3232 18	6/16 10:51
3	V(BLK) 611D	6/11 13:30					BFB	6/16 0:06
4	C3232 18	6/11 15:25					C3232-D 19	6/16 9:25
5	C-3232-D 19	6/11 16:20					C3232-MS 20	6/16 11:10
6	C-3232-MS 20	6/11 19:05					C-3233 21	6/16 12:30
7	V(BLK) 611E	6/11 19:53					C-3234 22	6/16 13:53
8	C-3233 21	6/11 20:40		DFTPP	6/11 8:15		C-3235 23	6/11 15:05
9	C-3234 22	6/11 21:30					C-3236 24	6/11 16:00
10	C-3235 23	6/11 22:20					C-3237 25	6/11 17:20
11	CPR(STD) 611C	6/11 23:10					C-3238 26	6/11 18:20
13	(M)BLK 41	6/12 3:30	12	BFB	6/12 0:33		C-3240 27	6/11 19:15
14	912F 24 ANOTHER PROJ	6/12 4:40					C-3241 28	6/11 20:10
15	C-3238 26	6/12 5:30					C-3242 29	6/11 21:05
16	VPP(STD) 612A	6/12 6:15					C-3244 30	6/11 22:00
17	V(BLK) 612B	6/12 7:15		DFTPP	6/12 1:45		C-3244D 31	6/12 3:55
18	C3236 24	6/12 8:06					C-3244MS 32	6/12 4:50
19	C-3237 25	6/12 8:59					C-3245 33	6/12 5:45
20	C-3240 27	6/12 10:05					C-3246 34	6/12 8:40
21	V(BLK) 612C	6/12 10:55					M-BLK AR 41	6/12 9:40
22	C-3241 28	6/12 11:45					M-BLK SED 42	6/12 10:35
23	C-3242 (F)BLK 29	6/12 12:30						
26	VPP(STD) 613B	6/13 9:00	24	BFB	6/12 16:30			
27	(M)BLK 42	6/13 10:00	25	BFB	6/13 8:40			
28	C3244MS 32	6/13 11:10						
29	V(BLK) 613C	6/13 12:05						
30	C-3245 33	6/13 12:55						
31	V(BLK) 613D	6/13 13:20						
32	C-3246 (F)BLK 34	6/13 14:25	33	BFB	6/13 20:30			
35	VPP(STD) 614E	6/14 8:35	34	BFB	6/14 9:20			
36	C-3244 30	6/14 10:05						
37	C-3244D 31	6/14 10:30						

BLK?

VOA BLANK ANALYSIS RESULTS FOR TARGET COMPOUNDS p1 of 2

FRACTION	TYPE	CONC	MATRIX	SAMPLE #	SOURCE OF H ₂ O	CONTAMINANTS (CONCENTRATION / DETECTION LIMIT)
VOA	FIELD	Lo/AQ		C-3242 909-29	HPLC	Methylene Chloride (.053 mg/L /) Chloroform (.003 mg/L /) ORIGINAL (Red)
VOA	METHOD BLANK	Lo/AQ		909-41	ERG	Methylene Chloride (.003 mg/L /)
VOA	LAB BLANK	Lo/AQ		611D [3]	ERG	Methylene Chloride (.018 mg/L /) 1,3-dichlorobenzene (.002 mg/L /) 1,4-dichlorobenzene (.001 mg/L /) 1,2-dichlorobenzene (.002 mg/L /)
VOA	LAB BLK	Lo/AQ		611E [3]	ERG	None Reported (many crossed off Q.L.)
VOA	LAB BLK	Lo/AQ		612B [3]	ERG	Methylene Chloride (.024 mg/L /)
VOA	LAB BLK	Lo/AQ		612C	ERG	Methylene Chloride (.005 mg/L /)
VOA	METHOD BLANK	Lo/AQ		909-42 [3]	ERG	Methylene Chloride (.014 mg/L /) Acetonitrile (.007 mg/L /) trichloroethene (.001 mg/L /) Toluene (.001 mg/L /)
VOA	LAB BLK	Lo/AQ		613C	ERG [3]	CH ₂ Cl ₂ (.08), 1,1,1-trichloroethane (.001), TCE (.002), Benz (.001), Tol (.001)
VOA	LAB BLK	Lo/AQ		614C	ERG	NONE FOUND
VOA	FIELD	Lo/SOL		C-3244 909-34	HPLC	Methylene Chloride (.040 mg/L /) Trichloroethylene (.004 mg/L /) Benzene (.028 mg/L /) Tetrachloroethene (.002 mg/L /) Toluene (.015 mg/L /) 1,2-Dichlorobenzene (.001 mg/L /) Ethylbenzene (.001 mg/L /)

LABORATORY REPORTED FIELD BLANK DATA IS COMPARED WITH THE SAMPLE DATA IN A TABULATION FORM WITHIN THE SAMPLE ANALYTICAL DATA SUMMARY. TENTATIVELY IDENTIFIED COMPOUNDS IN BLANKS ARE LISTED ON A SEPARATE FOR

COMMENTS:

- (1) RESULT REPORTED BY LABORATORY AND CONFIRMED BY REVIEWER.
 - (2) RESULT INFERRED FROM QUANTITATION LIST, DIAGNOSTICS, CHROMATOGRAM AND/OR SPECTRA.
 - (3) BLANK RUN AFTER A STANDARD OR SPIKE, THEREFORE NOT USED TO QUESTION SAMPLES EXCEPT THOSE RUN IMMEDIATELY AFTER THE BLANK (1X CULC).
- C-3232 Chlorobenzene is real <.01, NO ghosting, ~~not~~ NOT FOUND in preceding blank.
- C-3234 1,1-dichloroethane <.01 real, no ghosting (after BUCK SAMPLE), matching quality good, trans-1,2-dichloroethane @ .03 real also for same reasons.
- C-3236 1,1-dichloroethane, vinyl chloride real, no ghosting after LABLANK, SPECTRA QUAL. GOOD.

p2 of 2

(Red)

COMMENTS:

- [illegible]

SURROGATE SPIKE RECOVERIES

* Asterisked values are outside of QC limits

ORIGINAL
(Red)

Surrogate
compound name:

DC - Benzene

2-Bromo-1-Chloro
Propane

D3-2,4-Dichloro
Phenol

D5-Aniline

D10-Biphenyl

Methoxychlor

Analytical Fraction:	VOA	VOA	ACID	BN	BN	PEST						
QC water:	70-130	70-130	25-120	40-120	40-120	40-120						
LIMITS: soil:	70-130	70-130	25-120	40-120	40-120	40-120						
source:	Ref. 2	Ref. 3	Ref. 3	Ref. 3	Ref. 3	Ref. 3	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Matrix	Sample no.											
AQ	C-3232	92	96	140*	113	153*	62					
	C-3233	79	120	74	114	57	60					
	C-3234	53*	63*	41	69	47	81					
	C-3235	53*	59*	72	137*	66	78					
	C-3236	99	94	37	135*	65	72					
	C-3237	98	95	78	126*	63	80					
	C-3238	95	91	72	102	52	84					
	C-3240	98	92	61	107	57	63					
	C-3241	97	93	108	134*	72	72					
✓	C-3242	95	96	63	110	58	69					
SOL	C-3244	90	77	49	33*	46	123*					
	C-3245	116	105	115	46	49	88					
✓	C-3246	103	90	124*	136*	110	88					
AQ	BLK611D	98	100									
AQ	C-3232-D	83	88	86	107	94	49					
AQ	C-3232-MS	69*	79	80	118	62	84					
AQ	BLK611E	83	80									
AQ	M BLK AQ	96	97	6*	174*	163*	63					
SOL	M BLK SOL	101	93	86	94	70	12*					
SOL	C-3244-MS	110	110	145	84	152*	71					
SOL	C-3244-D	116	90	37	42	52	52					

Source of QC Limits: Ref. 1: IFB WA-83-0634, Am. 1

Ref. 2: Instructional Guide for Reviewing GC/MS Data, version (11/5/82).

COMMENTS:

Ref. 3: Adopted for review purposes

ASTERISKED VALUES NOT COMMENTED UPON WERE CONSIDERED NOT TO BE SIGNIFICANTLY OUT OF RANGE TO QUESTION RESULTS.

Reported levels of VOA compounds in samples C-3234, C-3235 may be slightly higher than reported

LAB Blank, duplicate and spike samples were not used to question results if additional on other sample results were within range

QUANTITATION REPORT

FILE: V90920MSPK

CLIENT :

NUS

Asterisked values outside
of control ranges

PROJECT NUMBER :

1080

CLIENT SAMPLE ID. :

V90920MSPK

MC-3232-MSPK

VOL., OR WT. OF SAMPLE, IN ULS OR MGS :

5000.000

VOLUME OF SURROGATE SPIKE USED, IN ULS :

0.999

VOL. OF MATRIX SPIKE USED, IN ULS :

5.000

See Comment Page at end of matrix spike report sheets
SURROGATE SPIKE RECOVERY

COMPOUND	CONCENTRATION FOUND, MG/L	SPIKED CONC., MG/L	% RECOVERY
D6-BENZENE (SURR)	0.030	0.043	69 %
2-BROMO-1-CHLOROPROPANE (SURR)	0.024	0.031	79 %

VOLATILE PRIORITY POLLUTANT SPIKE RECOVERY

General Recovery Range
ADOPTED for review purposes
(40-120 %)

COMPOUND	CONCENTRATION FOUND, MG/L	SPIKED CONC., MG/L	% RECOVERY
CHLOROMETHANE	0.000	0.040	1 %*
BROMOMETHANE	0.000	0.040	1 %*
VINYL CHLORIDE	0.000	0.040	1 %*
CHLOROETHANE	0.000	0.040	1 %*
METHYLENE CHLORIDE	0.030	0.043	69 %
ACROLEIN (PROPENAL)	0.169	0.109	*154 %
TRICHLOROFLUOROMETHANE	0.040	0.046	87 %
1,1-DICHLOROETHYLENE	0.044	0.057	77 %
ACRYLONITRILE	0.215	0.158	*135 %
1-DICHLOROETHANE	0.040	0.052	77 %
TRANS-1,2-DICHLOROETHYLENE	0.044	0.056	79 %
CHLOROFORM	0.039	0.051	77 %
1,2-DICHLOROETHANE	0.044	0.051	85 %
1,1,1-TRICHLOROETHANE	0.055	0.060	91 %
CARBON TETRACHLORIDE	0.038	0.047	81 %
BROMODICHLOROMETHANE	0.056	0.071	79 %
1,2-DICHLOROPROPANE	0.038	0.053	71 %
TRANS-1,3-DICHLORO-1-PROPENE	0.039	0.052	75 %
TRICHLOROETHYLENE	0.036	0.055	66 %
BENZENE	0.050	0.068	74 %
DBCM DIBROMOCHLOROMETHANE	0.094	0.066	*141 %
CIS-1,3-DICHLORO-1-PROPENE	0.034	0.048	72 %
1,1,2-TRICHLOROETHANE	0.034	0.051	67 %
2-CHLOROETHYL VINYL ETHER	0.000	0.066	0 %*
BROMOFORM	0.058	0.068	85 %
TETRACHLOROETHENE	0.046	0.064	72 %
1,1,2,2-TETRACHLOROETHANE	0.045	0.050	90 %
TOLUENE	0.035	0.050	70 %
CHLOROBENZENE	0.040	0.052	77 %
ETHYL BENZENE	0.036	0.048	74 %
1,3-DICHLOROBENZENE	0.049	0.067	73 %
1,4-DICHLOROBENZENE	0.037	0.051	72 %
1,2-DICHLOROBENZENE	0.040	0.051	78 %

not in standard [A]

VOA matrix spike SOLID

QUANTITATION REPORT

FILE: V90932

Asterisked values outside
of control Ranges
(Red)

CLIENT : NUS

PROJECT NUMBER : 1088

CLIENT SAMPLE ID. : V90932 MC-3244 MSFK

VOL., OR WT. OF SAMPLE, IN ULS OR MGS : 5429.990

VOLUME OF SURROGATE SPIKE USED, IN ULS : 0.999

VOL. OF MATRIX SPIKE USED, IN ULS : 5.000

See comment page at end of matrix spike report sheets

SURROGATE SPIKE RECOVERY General Recovery range adopted for
Review purposes (40-120%)

COMPOUND	CONCENTRATION FOUND, MG/KG	SPIKED CONC., MG/KG	% RECOVERY
D6-BENZENE (SURR)	0.044	0.039	110 %
2-BROMO-1-CHLOROPROPANE (SURR)	0.031	0.028	110 %

VOLATILE PRIORITY POLLUTANT SPIKE RECOVERY

COMPOUND	CONCENTRATION FOUND, MG/KG	SPIKED CONC., MG/KG	% RECOVERY
CHLOROMETHANE	0.000	0.037	1 % *
BROMOMETHANE	0.000	0.037	1 % *
VINYL CHLORIDE	0.000	0.037	1 % *
CHLOROETHANE	0.000	0.037	1 % *
METHYLENE CHLORIDE	0.971	0.040	2420 %
ACROLEIN (PROPENAL)	0.104	0.101	102 %
TRICHLOROFLUOROMETHANE	0.042	0.043	98 %
1,1-DICHLOROETHYLENE	0.050	0.053	94 %
ACRYLONITRILE	0.122	0.146	83 %
1,1-DICHLOROETHANE	0.046	0.048	95 %
1,2-DICHLOROETHYLENE	0.050	0.051	97 %
CHLOROFORM	0.047	0.047	99 %
1,2-DICHLOROETHANE	0.046	0.047	96 %
1,1,1-TRICHLOROETHANE	0.063	0.055	114 %
CARBON TETRACHLORIDE	0.049	0.043	113 %
BROMODICHLOROMETHANE	0.075	0.065	115 %
1,2-DICHLOROPROPANE	0.055	0.049	111 %
TRANS-1,3-DICHLORO-1-PROPENE	0.054	0.048	112 %
TRICHLOROETHYLENE	0.061	0.051	120 %
BENZENE	0.067	0.063	106 %
DIBROMOCHLOROMETHANE	0.068	0.061	111 %
CIS-1,3-DICHLORO-1-PROPENE	0.044	0.044	99 %
1,1,2-TRICHLOROETHANE	0.050	0.047	107 %
2-CHLOROETHYL VINYL ETHER	0.000	0.060	0 % *
BROMOFORM	0.060	0.063	95 %
TETRACHLOROETHENE	0.067	0.059	113 %
1,1,2,2-TETRACHLOROETHANE	0.041	0.046	89 %
TOLUENE	0.048	0.046	103 %
CHLOROBENZENE	0.048	0.047	101 %
ETHYL BENZENE	0.046	0.044	104 %
1,3-DICHLOROBENZENE	0.050	0.061	81 %
1,4-DICHLOROBENZENE	0.035	0.047	75 %
1,2-DICHLOROBENZENE	0.038	0.047	81 %

[A] Lab reports NOT IN STANDARD

QUANTITATION REPORT

FILE: AB90920MSPK

CLIENT : NUS

BNA MATRIX SPIKE AQ ORIGINAL (Red)

PROJECT NUMBER : 1088

ASTERISKED VALUES OUTSIDE OF
CONTROL RANGE

CLIENT SAMPLE ID.: C3232 MSPK

AMOUNT OF SAMPLE EXTRACTED IN GMS OR MLS : 500.000
 FINAL VOL. OF ACIDIC EXTRACT IN MLS : 0.500
 ULS OF ACID EXTRACT INJECTED : 1.000
 FINAL VOLUME OF BN EXTRACT IN MLS : 0.500
 ULS OF BN EXTRACT INJECTED : 1.000
 ULS OF SURROGATE SPIKE USED : 100.000
 ULS OF MATRIX SPIKE USED : 1000.000

SEE COMMENTS PAGE AT END OF matrix spike report sheets

SURROGATE SPIKE RECOVERY

COMPOUND	CONCENTRATION FOUND, MG/L	SPIKED CONC., MG/L	% RECOVERY
D3 2,4-DICHLOROPHENOL <SURR>	0.085	0.106	80 %
D5 ANILINE <SURR>	0.243	0.204	118 %
D10 BIPHENYL <SURR>	0.128	0.204	62 %

General recovery ranges
adopted for review
purposes (40-120%)

SPIKE RECOVERIES FOR ACID AND BN EXTRACTABLES

COMPOUND	CONCENTRATION FOUND, MG/L	SPIKED CONC., MG/L	% RECOVERY
2CPHE 2-CHLOROPHENOL	0.156	0.216	72 %
PHENO PHENOL	0.072	0.212	34 % *
2NPHE 2-NITROPHENOL	0.203	0.206	98 %
24DMP PHENOL, 2,4-DIMETHYL-	0.145	0.216	67 %
24DCP 2,4-DICHLOROPHENOL	0.189	0.204	92 %
34CMP P-CHLORO-M-CRESOL	0.222	0.212	104 %
246TC 2,4,6-TRICHLOROPHENOL	0.215	0.202	106 %
4NPHE 4-NITROPHENOL	0.155	0.208	74 %
M46DP 2-METHYL-4,6-DINITROPHENOL	0.231	0.190	121 % *
PENTA PENTACHLOROPHENOL	0.200	0.214	93 %
NNDMA METHANAMINE, N-METHYL-N-NITRO	0.069	0.208	33 % *
B2CET BIS(2-CHLOROETHYL)ETHER	0.163	0.212	77 %
13DCB 1,3-DICHLOROBENZENE	0.107	0.210	50 %
14DCB 1,4-DICHLOROBENZENE	0.105	0.202	52 %
12DCB 1,2-DICHLOROBENZENE	0.108	0.202	53 %
BISCI PROPANE, 2,2'-OXYBIS\2-CHLORO	0.176	0.212	82 %
HXCET HEXACHLOROETHANE	0.095	0.204	46 %
NNDNP 1-PROPANAMINE, N-NITROSO-N-PR	0.229	0.216	106 %
NITBE NITROBENZENE	0.207	0.212	97 %
ISOPH ISOPHORONE	0.222	0.208	106 %
BISCM BIS(2-CHLOROETHOXY)METHANE	0.208	0.202	103 %
TCBNZ 1,2,4-TRICHLOROBENZENE	0.161	0.220	73 %
NAPHT NAPHTHALENE	0.174	0.210	82 %
HCBUT HEXACHLOROBUTADIENE	0.129	0.212	60 %
C56 HEXACHLOROCYCLOPENTADIENE	0.088	0.212	41 %
2CNAP 2-CHLORONAPHTHALENE	0.166	0.200	82 %
ACENY ACENAPHTHYLENE	0.201	0.204	98 %
DMPHT DIMETHYL PHTHALATE	0.103	0.208	49 %
26DNT 2,6-DINITROTOLUENE	0.228	0.208	109 %
ACENE ACENAPHTHENE	0.199	0.212	94 %
24DNT 2,4-DINITROTOLUENE	0.218	0.216	101 %
FLUOR 9H-FLUORENE	0.203	0.202	100 %

DEPHT	DIETHYL PHTHALATE	0.147	0.216	68 %
12DPH	HYDRAZINE, 1,2-DIPHENYL-	0.278	0.208	133 %
NNDPA	N-NITROSODIPHENYL AMINE	0.120	0.204	59 %
BPPE	4-BROMOPHENYL PHENYL ETHER	0.201	0.220	91 %
HCB	BENZENE, HEXACHLORO-	0.112	0.200	56 %
PHENT	PHENANTHRENE	0.201	0.208	96 %
ANTHR	ANTHRACENE	0.366	0.210	173 %
DNBP	DIBUTYL PHTHALATE	0.197	0.212	92 %
FLUOT	FLUORANTHENE	0.200	0.208	96 %
PYREN	PYRENE	0.202	0.200	101 %
BENZI	BENZIDINE	0.014	0.214	6 %
BBP	BUTYL BENZYL PHTHALATE	0.147	0.212	69 %
CHRY	CHRYSENE	0.209	0.220	94 %
BEN-A	BENZ(A)ANTHRACENE	0.170	0.200	85 %
33DCB	DICHLOROBENZIDINE, 3,3'-	0.274	0.440	62 %
BEHP	BIS(2-ETHYLHEXYL)PHTHALATE	0.232	0.218	106 %
DOP	DI-N-OCTYL PHTHALATE	0.134	0.208	64 %

* ORIGINAL
(Red)

* [1]

THE DETECTION LIMIT IS 0.010 MG/L

C 3232 mspk

QUANTITATION REPORT

FILE: AB90932MSPK

CLIENT : NUS

BNA matrix spike SOLID
Asterisked values outside of control range.

PROJECT NUMBER : 1088

CLIENT SAMPLE ID.: C3244 MSPK

AMOUNT OF SAMPLE EXTRACTED IN GMS OR MLS : 67.300
 FINAL VOL. OF ACIDIC EXTRACT IN MLS : 0.500
 ULS OF ACID EXTRACT INJECTED : 1.000
 FINAL VOLUME OF BN EXTRACT IN MLS : 0.500
 ULS OF BN EXTRACT INJECTED : 1.000
 ULS OF SURROGATE SPIKE USED : 100.000
 ULS OF MATRIX SPIKE USED : 1000.000

See Comments page AT END OF matrix spike report sheet

SURROGATE SPIKE RECOVERY

COMPOUND	CONCENTRATION FOUND, MG/KG	SPIKED CONC., MG/KG	% RECOVERY
3 2,4-DICHLOROPHENOL <SURR>	1.148	0.788	145 %
D5 ANILINE <SURR>	1.274	1.516	84 %
D10 BIPHENYL <SURR>	2.311	1.516	152 %

SPIKE RECOVERIES FOR ACID AND BN EXTRACTABLES

GENERAL RECOVERY RANGES
ADOPTED FOR REVIEW
PURPOSES (40-120)

COMPOUND	CONCENTRATION FOUND, MG/KG	SPIKED CONC., MG/KG	% RECOVERY
2CPHE 2-CHLOROPHENOL	0.539	1.605	33 % *
PHENO PHENOL	1.185	1.575	75 %
2NPHE 2-NITROPHENOL	0.106	1.530	6 % *
24DMP PHENOL, 2,4-DIMETHYL-	0.021	1.605	1 % *
24DCP 2,4-DICHLOROPHENOL	0.072	1.516	4 % *
34CMP P-CHLORO-M-CRESOL	0.060	1.575	3 % *
246TC 2,4,6-TRICHLOROPHENOL	0.684	1.501	45 %
NPHE 4-NITROPHENOL	1.659	1.545	107 %
PENTA PENTACHLOROPHENOL	2.388	1.590	150 % *
NNDMA METHANAMINE, N-METHYL-N-NITRO	17.704	1.545	1145 % *
B2CET BIS(2-CHLOROETHYL)ETHER	1.124	1.575	71 %
13DCB 1,3-DICHLOROBENZENE	0.681	1.560	43 %
14DCB 1,4-DICHLOROBENZENE	0.673	1.501	44 %
12DCB 1,2-DICHLOROBENZENE	0.810	1.501	53 %
BISCI PROPANE, 2,2'-OXYBIS(2-CHLORO	6.518	1.575	413 % *
HXCET HEXACHLOROETHANE	0.442	1.516	29 % *
NNDNP 1-PROPANAMINE, N-NITROSO-N-PR	0.153	1.605	9 % *
NITBE NITROBENZENE	0.232	1.575	14 % *
ISOPH ISOPHORONE	1.388	1.545	89 %
TCBNZ 1,2,4-TRICHLOROBENZENE	1.157	1.634	70 %
NAPHT NAPHTHALENE	1.362	1.560	87 %
HCBUT HEXACHLOROBUTADIENE	1.127	1.575	71 %
2CNAP 2-CHLORONAPHTHALENE	0.124	1.486	8 % *
ACENY ACENAPHTHYLENE	0.065	1.516	4 % *
DMPHT DIMETHYL PHTHALATE	0.191	1.545	12 % *
26DNT 2,6-DINITROTOLUENE	1.354	1.545	87 %
ACENE ACENAPHTHENE	1.609	1.575	102 %
24DNT 2,4-DINITROTOLUENE	1.198	1.605	74 %
FLUOR 9H-FLUORENE	1.550	1.501	103 %
CPPE 4-CHLOROPHENYL PHENYL ETHER	1.421	1.575	90 %
DEPHT DIETHYL PHTHALATE	1.709	1.605	106 %
12DPH HYDRAZINE, 1,2-DIPHENYL-	1.779	1.545	115 %

ORIGINAL
(Red)

NNDPA	N-NITROSODIPHENYL AMINE	0.891	1.516	58 %
BPPE	4-BROMOPHENYL PHENYL ETHER	1.763	1.634	107 %
HCB	BENZENE, HEXACHLORO-	0.931	1.486	62 %
PHENT	PHENANTHRENE	2.277	1.545	147 % *
ANTHR	ANTHRACENE	2.550	1.560	163 % *
DNBP	DIBUTYL PHTHALATE	1.864	1.575	118 %
FLUOT	FLUORANTHENE	1.975	1.545	127 % *
PYREN	PYRENE	1.916	1.486	128 % *
BENZI	BENZIDINE	0.014	1.590	0 % * [1]
CHRY	CHRYSENE	1.825	1.634	111 %
BEN-A	BENZ\A\ANTHRACENE	2.078	1.486	139 % *
BEHP	BIS(2-ETHYLHEXYL)PHTHALATE	0.079	1.620	4 % * [2]
DOP	DI-N-OCTYL PHTHALATE	0.038	1.545	2 % *
BEN-B	BENZO\B\FLUORANTHENE	0.681	1.382	49 %

THE DETECTION LIMIT IS 0.100 MG/KG

C-3244

PESTICIDE

RANGE ADOPTED for
REVIEW PURPOSES
(40-120%)

Asterisked values
OUTSIDE OF CONTROL
RANGES

Matrix Spike Recoveries

Parameter	AQ 90920 (ug/L)			Solid ORIGINAL 90931 (mg/kg) ¹		
	Found	Actual	%	Found	Actual	%
γ BHC	0.46	0.83	55		-----	
Heptachlor	0.46	0.83	55		-----	
Aldrin	0.43	0.83	52		-----	
Heptachlor Epoxide	0.63	0.83	76		-----	
p,p'-DDE	2.9	3.2	90		-----	
p,p'-DDD	1.2	1.6	75		-----	
p,p'-DDT	1.2	6.4	19 * [3]		-----	
α Endosulfan	0.87	0.83	105		-----	
Dieldrin	with DDE				-----	
Endrin	3.0	3.2	94		-----	
β Endosulfan	0.46	3.2	15 * [3]		-----	
Endrin Aldehyde	1.5	3.2	48		-----	
Endosulfan cyclic sulfate	with DDT					

¹Could not observe spike levels of pesticides due to high levels of PCB

NUS CORPORATION
SUPERFUND DIVISION MATRIX SPIKE COMMENTARY

PROJECT NOTES

ASTERISKED VALUES WHICH WERE NOT COMMENTED UPON WERE NOT CONSIDERED SIGNIFICANT TO QUESTION SAMPLE RESULTS.

[1] Detection limits for benzidine in sample C-3232 may be slightly higher than that reported, and in C-3244 significantly higher than reported.

[2] Detection limits and/or results ^{if positive,} for 2,4-dimethylphenol, 2,4-dichlorophenol, 2-NITROPHENOL, p-chloro-m-cresol, NITROBENZENE, N-NITROSO-N-PROPYL-1-PROPANAMINE, 2-CHLORONAPHTHALENE, ACENAPHTHYLENE, dimethyl phthalate, bis(2-ethylhexyl) phthalate and di-N-octyl phthalate may be slightly higher than those reported, for sample C-3244.

[3] Detection limits for p,p'-DDT and β -ENDOSULFAN may be slightly higher than those reported for sample C-3232.

~~NO DETECTION~~

NUS CORPORATION
SUPERFUND DIVISION

Duplicate Analysis Results

PROJECT NOTES

Since duplicate ANALYSIS WAS performed on unspiked samples only surrogate spike compounds and target compound hits (As designated by the laboratory) were evaluated. RPD's were calculated only for extreme values according to the following Criteria:

RPD Review Criteria: AQUEOUS BNAP 50% SOLID BNAP 60%
VOA 20% VOA 30%

EQUIVALENT RATIO CRITERIA: $m = \frac{(2+N)}{(2-N)}$

RPD	RATIO
50%	1.67
20%	1.22
60%	1.86
30%	1.35

The ABOVE CRITERIA were ADOPTED for review purposes.

ORIGINAL
(Red)

(Red)

VOA

RPD'S not commented upon were not considered significant to question sample results.

P. 1 of 2

COMMENTS: UF = not found
PCB match is confident, based on capillary column match. See lab comments on quantitation.

EVALUATION OF CONFIRMATIONS OF GC ANALYSES

R2 of 2

SAMPLE NO.	COMPOUND	GC COLUMN # 1				GC COLUMN # 2				GC/MS DATA										TYPE OF CONFIRMATION (2 COL / GC/MS)	REVIEWER CONFIDENT
		COLUMN: SE-54 capillary CONDITIONS: 175°F 5-257°C 10 DETECTOR: ECD OTHER:				COLUMN: 1.5/1.45 SP2250/SP2401 CONDITIONS: 190° IsoT. DETECTOR: ECD OTHER:				COLUMN: CONDITIONS: DETECTOR: OTHER:											
		DATA FROM COLUMN # 1:				DATA FROM COLUMN # 2:				DATA FROM GC/MS RUN(S):											
		<input checked="" type="checkbox"/> RET. OR <input type="checkbox"/> REL. RET. TIMES IN:		RELATIVE PEAK AREA RATIOS		<input type="checkbox"/> RET. OR <input type="checkbox"/> REL. RET. TIMES IN:		RELATIVE PEAK AREA RATIOS		SPECTRUM MATCH (Y/N)		LEVEL HIGH ENOUGH FOR GC/MS		WHICH EXTRACT		<input type="checkbox"/> SCAN NO. <input type="checkbox"/> RET. OR <input type="checkbox"/> REL. RET. TIMES IN:		RELATIVE PEAK AREA RATIOS			
Sample	Standard	Sample	Standard	Sample	Standard	Sample	Standard	Sample	Standard							Sample	Standard	Sample	Standard		
C3244	PCB 1260 R.T. reference peak → PCB peaks	6/29 13:04	6/28 15:14																2c.	Yes	
		11.99	12.02																		
		13.36	13.30	7	16																
		13.56	13.59	24	37																
		13.83	NF	33	—																
		14.16	14.19	29	50																
		14.45	14.48	14	29																
		14.67	14.66	11	7																
		14.80	14.83	43	53																
		14.96	NF	8	—																
		15.17	15.19	19	36																
		15.29	15.30	11	21																
		15.46	NF	8	—																
		NF	15.56	—	7																
		15.73	15.76	12	30																
		15.83	15.90	5	18																

COMMENTS: NF = Not Found

PCB match is confident, based upon capillary column match. See lab comments on quantitation.

ORIGINAL

Comments on Results for GC/EC - Pesticides/PCB Analyses

ORIGINAL
(Red)

1. Peak matching RRT of DDT found in blanks, thus higher detection limit given.
2. Sample ^{C-3244-Dup} 90931 extract lost after primary analysis, confirmation could not be performed.
3. For all matrix spikes, recoveries of dieldrin and endosulfan cyclic sulfate are combined with DDE and DDT, respectively because of non separation.
4. Sample ^{C-3244-MS} 90932 - Could not observe spiked levels of pesticides due to high levels of PCB.
5. For samples ^{C-3244} 90930 and ^{C-3245} 90933, PCB 1260 was qualitatively confirmed only. Due to numerous sulfur treatments and low extract volumes, quantitation could not be accurately performed.
6. Detection limits of 0.01 ug/L in waters could not be achieved because of low sensitivity of detector. Final volumes of extracts were 0.5 ml. It was felt that concentrating to a lower volume to achieve better detection limits would have sacrificed accuracy in results.
7. Results for soil samples expressed as dry weight.
8. Detection limits are higher for ^{C-3244 44-D} 90930, ^{C-3245} 31, and 33 due to positive levels of PCB's.

QUANTITATIVE CALCULATIONS

ORIGINAL
(Red)

CALCULATION ERRORS AND CORRECTED RESULTS ARE LISTED BELOW:

BNA SOLID sample detection limits are reported to be $.01 \text{ mg/kg}$, however the actual detection limits are 10 times higher, $.1 \text{ mg/kg}$.

Aqueous extraction volumes were as follows: 500 ml's extracted final conc. 1 ml , volume injected 1.0 ul .

Solid extraction volumes: 50 grams extracted, final conc. 1 ml , volume injected 1.0 ul .

Approximately 10 times more aqueous sample was processed than solid sample, yet final volume & injected volume stayed the same. A $.01 \text{ mg/L}$ detection limit was reported for the aqueous samples, so without further concentration or higher injected volumes, the detection limit for solid samples must be 10 times higher.

A spot check of reported values for C-3244 verified results were correctly calculated from sample weights given, assuming a RF of 1.00.

However all reported values $< .1 \text{ mg/kg}$ are considered approximate values.

ORIGINAL
(Red)

SAMPLE #	FRACTION	SCAN #(S) OB/EXP	SPECTRUM MATCH INDICES		ESTIMATED CONCENTRATION	COMPOUND NAME	COMMENTS
			TYPE	SCORE			
C3234	V6A	134/142					<p>trans-1,2-dichloroethene → must be cis-1,3-isomer instead</p> <p>The value for expected scan number was calculated from the 1,1-dichloroethane observed in the sample & standard, instead of the internal standard at scan 102 in the sample and 106 in the standard. Also D6-Benzene was at 299 in sample and 309 in standard</p>

PROJECT NAME: EAST RICHMOND Rd.
TDD NO: F3-8305-38EPA SITE NO.: VA-124
REGION: IIIQUALITY ASSURANCE REVIEW OF
INORGANIC ANALYTICAL DATA PACKAGECase No.: 1794
Contract No.: _____
Contract Laboratory: ERG (as SUBCONTRACTOR)
Applicable IFB No.: NOT APPLICABLE [2]
Reviewer: Atwood F. Davis
Review Date: 4-27-84

Applicable Sample No's.:

MC-0910 through and including MC-0916,
MC-0918, MC-0919, MC-0920, MC-0922,
MC-0923 and MC-0924

The inorganic analytical data for this case has been reviewed. The quality assurance evaluation is summarized in the following table:

Reviewer's Evaluation*	Fraction			
	TASK I ICP or AA METALS	TASK II FURNACE AA METALS	TASK III COLD VAPOR AA MERCURY	TASK III CYANIDE
Acceptable			✓	✓
Acceptable with exception(s)	✓ 3,5	✓ 3,4,5		
Questionable				
Unacceptable				

* Definitions of the evaluation score categories are listed on next page.

This evaluation was based upon an analysis of the review items indicated below:

- DATA COMPLETENESS
- BLANK ANALYSIS RESULTS
- MATRIX SPIKE RESULTS
- DUPLICATE ANALYSIS RESULTS
- ☐ STANDARD ADDITIONS RESULTS
- ☐ QUANTITATIVE CALCULATIONS
- ☐ INITIAL CALIBRATION VERIFICATION
- ☐ CONTINUING CALIBRATION VERIFICATION
- ☐ INTERFERENCE QC RESULTS
- ☐ DETECTION LIMITS RESULTS
- ☐ INSTRUMENT SENSITIVITY REPORTS

Data review forms are attached for each of the review items indicated above.

✦ No errors noted, no form attached.

● Spot Check performed.

Comments: [1] NOT REQUESTED IN SUBCONTRACT REPORTING REQUIREMENTS
[2] See INTERNAL CORRESPONDENCE C-585-6-3-24 Re: Subcontract Requirements
included AT the back of this Appendix.
[3] See blank analysis results.
[4] See matrix spike recoveries.
[5] See detection limit results.

DATA EVALUATION SCORE CATEGORIES

ACCEPTABLE: Data is within established control limits, or the data which is outside established control limits does not affect the validity of the analytical results.

ACCEPTABLE WITH EXCEPTION(S): Data is not completely within established control limits. The deficiencies are identified and specific data is still valid, given certain qualifications which are listed below.

QUESTIONABLE: Data is not within established control limits. The deficiencies bring the validity of the entire data set into question. However, the data validity is neither proved nor disproved by the available information.

UNACCEPTABLE: Data is not within established control limits. The deficiencies imply the results are not meaningful.

INORGANIC DATA COMPLETENESS CHECKLIST

ORIGINAL
(Red)

TRAFFIC REPORT #		MC-0910	0911	0912	1913	0914	0915	0916	0918	0919	0920	0922	0923	0924
MATRIX (SOLAR)		AA										SOL	SOL	SOL
(LO, MED, HI) CONC.		LO												
FIELD	BLANK										✓			✓
QC	DUPLICATE													
	SPIKE													
TASK I: ICAP or AA Metals	Rawdata	NA												→
	TAB. results	✓												→
	TAB. D.L.'s	✓												→
	QA Form	✓ [1]												→
	ICAP Interference QC	NA												→
	Instr. Sens.	NA												→
TASK II: ICAP or AA Met	Rawdata	NA												→
	TAB. results	✓												→
	TAB. D.L.'s	✓												→
	QA Form	✓ [1]												→
	Instr. Sens.	NA												→
TASK II: Cold Vapor AA: Mercury	Rawdata	NA												→
	TAB. results	✓												→
	TAB. D.L.'s	✓												→
	QA Form	✓ [1]												→
	Instr. Sens.	NA												→
TASK III: Cyanide	Rawdata	NA												→
	TAB. results	✓												→
	TAB. D.L.'s	✓												→
	QA Form	✓ [1]												→
	Instr. Sens.	NA												→
Other: (Specify):	Raw data													
	TAB. results													
	TAB. D.L.'s													
	QA Form													
	Instr. Sens.													
Other: (Specify):	Rawdata													
	TAB. results													
	TAB. D.L.'s													
	QA Form													
	Instr. Sens.													

Comments: [1] Spike Results ONLY
 NA : NOT APPLICABLE, NOT required in subcontract requirements

FRACTION	TYPE OF BLANK	SAMPLE NO.	SOURCE OF	CONTAMINANTS (concentration/DL)
ALL	FIELD Lo/AQ	MC-0920	HPLC	AL (.04 mg/L / .2) Co (.004 mg/L / .05) Cu (.007 mg/L / .05) Ni (.01 mg/L / .04) Zn (.093 mg/L / .01) B (.1 mg/L / .1) SNC (.04 mg/L / .02) Cd (.006 mg/L / .001)
ALL	FIELD Lo/SOL	MC-0924 90934	HPLC	NONE FOUND
ALL	LAB Lo/AQ	90941 C3232 LAB BLK	ERG	Sb (.02 mg/L / .02) Sn (.06 mg/L / .02) Cd (.005 mg/L / .001) Al (.02 mg/L / .2) Co (.004 mg/L / .05)
ALL	LAB Lo/SOL	90942 C3244 LAB BLK	ERG	Cu (.011 mg/kg / .5)

COMMENTS: [1] Reported by LAB

MATRIX SPIKE RECOVERIES

Sample No.	MC-0910	MC-0922				
Field Spike						
Lab Spike	✓	✓				
Matrix	AQ	SDL				
Conc. Level		LO				
Method Std.						
Fraction	ALL	ALL				

All matrix spike recoveries were within the established control ranges specified in;
IFB WA8 -A , Exhibit E, Table 2.

___ Yes ___ No

Exception(s):

Parameter	Accepted Range (%)	Actual % Rec.	Sample Number	Org. Result	Spike Added	Spike Result	Units
CN	80-120	64	MC-0910	ND (.01)	.25		
Pb	75-125	72		.86	.05		
Ag	80-120	68		.002	.05		
Fe	80-120	132		380	.25		
B	80-120	133		.7	1.00		
Cu	80-120	24	MC-0922	50	25		
[3] BA	80-120	NA		130	25		
Co	80-120	132		7	25		
[1] Se	75-125	0		<2	2		
B	80-120	124		7.1	6.72		
SD	75-125	130		58	62.5		
[1] Se	75-125	0	MC-0910	<.01	.01		
[2] AL	80-120	0	MC-0922	12,000	6.25		
[2] Fe	80-120	0	MC-0922	41,000	62.5		
[3] Ba	80-120	NA	MC-0910	1.8	1.0		

Comments: [1] ^{SE} D.L.'s for all samples may be significantly higher than those reported
 [2] Spiked with too low a concentration to see recoveries.
 [3] without tabulated spike results, impossible to calculate % Recovery
 The remaining uncommented recoveries were not considered significantly out of range to question sample results.

NUS CORPORATION
SUPERFUND DIVISION

DUPLICATE ANALYSIS WORKSHEET

PROJECT NOTES

SAMPLE	mg/L			mg/kg			
	MC-0910	L%AA		MC-0922	L%Sol		
	D ₁	D ₂	RPD	D ₁	D ₂	RPD	
Al	180	200	1	12000	13000	8	
Cr	.045	.052	14	49	50	2	
Ba	1.9	1.8	5	130	130	0	
Be	.011	.011	0	ND	ND		
Co	.096	.10	4	7	7	0	
Cu	.70	.71	1	63	88	33	
Fe	370	380	3	40000	42000	5	
Ni	.19	.20	5	13	15	14	
Mn	1.5	1.5	0	200	200	0	
Zn	.20	.20	0	440	380	15	
B	.8	.7	13	6.6	7.6	14	
V	.7	.9	[1] 25 *	40	40	0	
Ag	.002	.002	0	2.7	2.2	20	
As	.045	.044	2	4.6	6.4	33	
Sb	.03	<.02	[2] 200 *	ND	ND	-	
Se	ND	ND		ND	ND	-	
Tl	.15	.18	18	14	12	15	
Hg	.002	.0018	10	0.5	0.5	0	
Sn	.37	.30	[1] 21 *	64	51	23	
Cd	.020	.020	0	ND	ND	-	
Pb	.89	.84	6	200	190	5	
Cu	ND	ND		ND	ND		

Comments: * Asterisked values OUTSIDE OF CONTROL RANGES

[1] NOT SIGNIFICANTLY OUT OF RANGE TO QUESTION RESULTS

[2] NOT SIGNIFICANT DUE TO LOW SAMPLE CONCENTRATIONS

Detection Limits ResultsDetection limits were reported for all samples analyzed: Yes ☒ No ☐Exceptions: _____

_____Detection limits were less than or equal to the required detection limits specified in INTERNAL CORRESPONDENCE 585-6-3-24. Yes ☐ No ☒

(Required)

Exceptions: SOLID D.L.'s; Pb 3(.5), 6X; Hg .1(.02), 5X; Sn 20(2), 10X;
D.L's Aqueous; Tl .02(.01), 2X; Fe 1(.05) 20X; Sn .06(.02); 3X

Reported D.L.

Times Higher Than Required D.L.

Key: Pb 3 (.5), 6X
Compound Reg. D.L.Instrument Sensitivity Reports

Instrument sensitivity reports were documented for all parameters: NOT APPLICABLE

Yes ☐ No ☐Comments: _____
_____Other Remarks Concerning this Case:

TO: Participant Bid Laboratories

DATE: June 8, 1983

FROM: Russell J. Sloboda, NUS Region III ^{RS}

COPIES:

SUBJECT: Subcontract Requirements

This memorandum documents the specific information telephoned to several laboratories on June 8, 1983 regarding subcontract requirements.

Introduction

NUS Corporation, working for EPA on Superfund hazardous waste site investigations, intends to subcontract work for organic analysis of samples. Two sites will be involved in this subcontract. For both sites, water and soil samples will require volatile and acid/base/neutral GC/MS analyses, and also pesticide, PCB, and TCDD analyses. In addition, one site will also include analyses for specific metals and cyanide. Verbal bids on work must be telephoned by close of business on June 8, 1983. Written verification of all bids must be mailed by close of business on June 9, 1983. Laboratories must state in their bids if any of the requirements stated herein cannot be met.

Schedule of Work to be Performed

- o Expected number of samples: The site requiring both organic and inorganic analysis is designated as Case 1794. For this site, the expected number of samples are 5 low concentration solid samples, 15 low concentration aqueous samples, and 5 medium concentration solid samples. (The medium concentration category indicates that these samples are expected to be above 10 ppm in one or more contaminants, based upon visual observation, air monitoring, and background information.) The site requiring only organic analysis is designated as Case 1797. For this site, the expectation is for 6 low concentration solid samples, and 8 low concentration aqueous samples. Actual number of samples could be somewhat different, since these estimates were derived from background information and may be modified during the actual site inspections.
- o Expected date of shipping: June 8, 1983. Samples will be shipped Federal Express. The laboratory will be notified by telephone when the samples are actually shipped, or if any changes in this timetable occur.
- o Holding times before analysis: VOA's: five (5) days from sample receipt until analysis; A/B/N's and Pesticides: five (5) days until extraction. For cyanide, 14 days until distillation. For metals, holding times are not relevant since results are due first. Samples must be refrigerated prior to analysis. These guidelines are taken from standard superfund laboratory contracts.
- o Receipt of results: Complete results and documentation must be received within 30 days of sample receipt.

Required tests to be performed

- o VOA: GC/MS analysis, method 624. Report priority pollutants plus 10 largest non-priority pollutant peaks of greatest apparent concentration but above 30 nanograms apparent (instrument) amount.
- o A/B/N: GC/MS analysis, method 625 using fused silica capillary columns. Report priority pollutants plus 20 largest non-priority pollutant peaks of greatest apparent concentration but above 10 nanograms apparent (instrument) amount.
- o Pesticides/
PCB's/TCDD: GC analysis using Electron Capture Detector. Use fused silica capillary columns, if possible. If levels are high enough, confirm by GC/MS. If levels are not high enough, positive results should consist of comparison with standards on two different GC columns. The following parameters should be analyzed for:

2,3,7,8 - TCDD

PCB aroclors 1016,1221,1232,1242,1248,1254,1260

aldrin	4,4'-DDE	endosulfan sulfate	heptachlor epoxide
dieldrin	4,4'-DDD	endrin	$\alpha, \beta, \gamma, \delta$ -BHC
chlordane	endosulfan I	endrin aldehyde	toxaphene
4,4'-DDT	endosulfan II	heptachlor	

- o Metals: Any approved analytical method may be used, provided that the required detection limits listed herein can be achieved. The following metals are to be analyzed for:

aluminum	beryllium	chromium	lead	silver	zinc
antimony	boron	copper	manganese	thallium	
arsenic	cadmium	iron	nickel	tin	
barium	cobalt	mercury	selenium	vanadium	

- o Cyanide: An approved method which meets the detection limits required in this subcontract must be used.

Payment

- o Bids should be for total cost per sample; 4 separate prices for organic and inorganic analysis for solids and aqueous samples. One "sample" is defined to be all analytical fractions for any one of the following: a real sample, a blank, a matrix spike, or a duplicate. (The laboratory will be expected to perform one lab (method) blank, matrix spike, and duplicate on all analytical fractions, separately for each matrix, water or soil, and separately for each site. See Q.C. Section.)
- o The laboratory will be paid the same (bid) price for all "samples", where a "sample" is defined above. However, payment will be limited to no more than one duplicate, blank, and matrix spike for each group of one to ten samples of the same matrix (solid/aqueous), within each case of samples from one site.

- o If it is not possible to perform all analyses on a sample, but at least one analysis is performed, the laboratory will still be reimbursed as if all analyses were performed. For example, if insufficient sample is present to perform an analysis, or if an accident occurs and insufficient sample remains to re-analyse the lost fraction, the laboratory will still be paid in full in order to cover the expenditure of time and effort and the fixed overhead, which is not covered in a separate fee under this subcontract.
- o The abovementioned statement regarding reimbursements for partial analyses does not apply to spikes, duplicates, or blanks: The laboratory will be paid only for the number of complete analyses for all fractions in the case of spikes or duplicates or laboratory blanks. For example, the laboratory will be paid for 2 laboratory blanks if 2 A/B/N, 2 pesticides, and 4 VOA laboratory blanks were analysed.

General QA/QC

- o Chain of Custody must be followed. A form will be sent with the samples. All original forms must be returned with the results.
- o Leftover sample remaining after analyses have been completed must be saved for 60 days, in case further analysis is desired.
- o Extracts should be saved for 6 months, but do not have to be refrigerated. Magnetic tape data should be saved for two years.
- o One matrix spike and duplicate must be performed on all fractions, for each matrix, water or soil. Spike with as many compounds as are currently in a stock mix and report all levels found.
- o One laboratory (method) blank must be performed on all fractions, for each matrix, water or soil. Run one VOA blank before each case, after every spike or standard, or more often as needed. Report all VOA blank results (as well as results for all other organic and inorganic blanks).
- o Homogenize solids carefully.

GC/MS QA/QC

- o Must meet EPA criteria for BFB and DFTPP, within previous 8 hours to all sample runs.
- o Calibrate with all priority pollutant compounds every 8 hours. Run approximately 50ng each (between 20 and 150ng). Should be able to see all compounds in standards.
- o If benzidine or 3,3'-dichlorobenzidine is available in current laboratory in-house standards, run a chromatography check every 8 hours using no more than 100ng of one of these compounds. Single ion chromatograms should be provided for the chromatography check runs.
- o The following minimum number of internal standards and surrogates must be used in every sample run:

Internal Standards

VOA's: 3
Acid/Base/Neutrals: 3
Pesticides: 1

Surrogate spikes

VOA's: 2
Acids: 1
Base/Neutrals: 2
Pesticides: 1

- o Internal standards must be used for all relative retention time identifications, as well as for all quantitation.
- o Add approximately 100 ug (+ 50ug) of each surrogate prior to extraction of acid/base/neutrals or pesticides. Higher levels may be used if matrix interferences are expected to cause problems in surrogate detection (due to extract dilution, concentration limitations, etc.).
- o Add approximately 100 ng of each surrogate prior to VOA analysis.

Metals Analysis QA/QC

- o Whenever spike recoveries indicate that sample results for a particular metal may not be accurate, a standard addition should be performed on all samples of the same matrix which have positive results for this element. It is left up to the professional judgement of the laboratory to determine the control limits for spike recoveries to be used as action levels for standard additions. Standard addition corrected results should be reported with a footnote that indicates this fact.
- o Run a calibration check standard after every 10 samples run on an instrument. Recalibrate if necessary, based upon laboratory control limits.

Detection Limits

- o Detection limits may be affected by matrix problems. For clean water samples, approximately 10ppb detection limits are expected for VOA's and acid/base neutrals, and 0.01ppb for pesticides analyzed by GC/EC. (It is understood that certain compounds, such as acrolein, acrylonitrile, 4-nitrophenol, benzidine, PCB's, and chlordane may have slightly higher detection limits.)
- o For inorganic analyses, required detection limits for soils should be no higher than 100 times the required limits for waters, which are listed below. (However, it is understood that occasional interferences may prevent these limits from being achieved in all cases.)

Element/Compound and Required Detection Limit in ug/l:

		mg/kg			mg/kg			mg/kg
aluminum	200	20	cobalt	50	5	nickel	40	4
antimony	20	2	chromium	10	1	selenium	2	.2
arsenic	10	1	copper	50	5	silver	10	1
barium	100	10	iron	50	5	thallium	10	1
beryllium	5	.5	mercury	0.2	.02	tin	20	2
boron	100	10	lead	5	.5	vanadium	200	20
cadmium	1	.1	manganese	15	1.5	zinc	10	1
						cyanide	10	1

- o The following amounts of sample should be extracted and/or analyzed if matrix problems are minimal:
Waters: 1 L for A/B/N's or pesticides, 5-10ml for VOA's
Solids: 25-50 grams for A/B/N's or pesticides, 5-10 grams for VOA's.
- o If it is not possible to meet these detection limits or to extract/analyze these amounts, an explanation should be documented in the results.

Documentation

- o Results should be reported as follows: For each sample, list all compounds analyzed for, with either the amount detected, or the approximate detection limit next to each compound. Results should be reported in ug/l or mg/kg.
- o For organic results, if less than detection limit values are found, report as such. (A footnote may be used to indicate that quantitations less than the detection limit may not be as accurate.) All positive results observed must be reported if greater than approximately 0.1 times detection limits. For inorganic analyses, reporting of results which are less than required detection limits is an option rather than a requirement.
- o Quantitations should be reported to two significant figures for priority pollutants, and to one significant figure for non-priority pollutant, tentatively identified compounds.
- o Include total ion chromatograms of each sample, spike, duplicate, blank, or standard normalized to the largest non-solvent peak. Label all peaks as internal standards, surrogate, or tentatively identified, using appropriate symbols.
- o Include automated quantitation lists printed by computer for all blanks, samples, spikes, duplicates, and standards. Indicate false positives and verified results on each quantitation list.
- o Include sample spectra of all priority pollutants seen in each sample.
- o Include sample spectra and spectra of the 3 best library matches for all non-priority pollutant, tentatively identified compounds in each sample. Utilize a purity search for library matching if this is possible.
- o Report all surrogate recoveries and matrix spike recoveries, including amount added and recovered. If zero recoveries, check for a problem, and document the explanation in the results.
- o Report the extraction weight/volume, the final extract volume, and the injection volume for each sample, for each analytical fraction.
- o Provide BFB and DFTPP intensity lists and spectra for each run.

- o If high enough levels of pesticides are detected, provide spectra of all pesticides identified by GC/MS, as well as GC/EC chromatograms for sample and standard.
- o When pesticides are detected at levels too low to be verified by GC/MS, provide chromatograms showing a comparison of sample with standards for two different GC columns. Pesticide compounds in both sample and standard chromatograms should be clearly labelled with compound names.

APPENDIX D

Site Name: East Richmond Road
TDD No.: F3-8305-38

ORIGINAL

(Red)

REFERENCE:

R. Stuart Royer and Associates, Inc. Report to City of Richmond,
Department of Public Works, Dated October 21, 1981.

ORIGINAL
(Red)

APPENDIX E

BORING LOG



ORIGINAL
(Red)
FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. X-1982-6

DATE

June 26, 1972

Made for: City of Richmond		Project: Landfill Areas - East Richmond Rd. Side				
Hole No.: 5-1	Total Depth: 50.0'	Elevation—Top of Hole: 39.88'		Hole Location:		
Type of Boring: H. S. Auger		Started 5/25/72	Completed 5/26/72	Driller: Duty		
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	Sheet 1 of 2
	0.0					
	3.0		Gray and Brown Silty Clayey Fine Sand	5	1.0	Water Data: Encountered Water @ 15.0' Water Level @ 14.75' with 49' of Casing below Ground Surface @ 16 Hours Water Level @ 20.67' with 49' of Casing Below Ground Surface After Pumping for 30 Min. Water Level @ 7.75' with 41' of Plastic Pipe Below Ground Surface Upon Removal of Auger
				5	4.0	
			Gray and Green Silty Sandy Clay	31	5.0	
	9.5			31	10.0	
			Gray Coarse Clayey Sand and Gravel	46	14.0	
	13.0			46	15.0	
			Greenish and Gray Fine to Coarse Sand and Gravel with Trace of Clay	61	19.0	
				61	20.0	
				32	24.0	
				32	25.0	
				100/8	29.0	
				100/8	30.0	
				100	34.0	
				100	35.0	
				76	39.0	
				76	40.0	

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

**No. of Blows 140-lb. Hammer, 20 in. Fall, Required to Drive 2 in. O.D. 1.375 in. I.D. Sample One Foot

Scale 1"=

BORING LOG



FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. **X-1982-6**DATE **June 26, 1972**

Made for: City of Richmond						
Project: Landfill Areas - East Richmond Rd. Side						
Hole No.: B-1		Total Depth: 50.0'		Elevation—Top of Hole: 39.88'		Hole Location:
Type of Boring: H. S. Auger			Started 5/25/72		Completed 5/26/72	
Driller: Duty						
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	Sheet 2 REMARKS
			Greenish and Gray Fine to Coarse Sand and Gravel with Trace of Clay		44.0	
				100	45.0	
					49.0	
	50.0		Boring Terminated @ 50.0'	49	50.0	

ORIGINAL
(Red)

SO-5A

BORING LOG

SINCE



1881

FROEHLING & ROBERTSON, INC.

INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No.

X-1982-6

DATE

June 26, 1972

Made for:		City of Richmond				
Project:		Landfill Areas - East Richmond Rd. Site				
Hole No.:	Total Depth:	Elevation—Top of Hole:	Hole Location:			
B-2	50.0'	43.5'				
Type of Boring:		Started	Completed	Driller:		
H. S. Auger		5/25/72	5/25/72	Duty		
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	Sample Blows	% Core Recovery	REMARKS
43.5	0.0					Sheet 1 of 2
42.5	1.0		Fill-Gray Silty Clay w/ Trace Sand & Brick	14	1.0	Water Data: Encountered Water @ 17.0' Water Level @ 18.5' With 49' of Casing Below Ground Surface @ 0 Hours Water Level @ 21.3' with 49' of Casing Below Ground Surface After Pumping for 30 Min. Water Level @ 18.3' with 47.5' of Plastic Pipe Below Ground Surface Upon Removal of Augers
39.5	4.0		Brown Silty Sandy Clay with Trace of Gravel		4.0	
				47	5.0	
36.0	7.5		Brown Silty Sand, Gravel and River Rock			
					9.0	
			Gray Fine Sandy Silt with Fine Gravel and Quartzite	7	10.0	
					14.0	
				42	15.0	
26.5	17.0					
			Green Clayey Sand and Gravel		19.0	
				47	20.0	
					24.0	
				35	25.0	
					29.0	
				78	30.0	
					34.0	
				100/8	34.8	
					39.0	
				63	40.0	

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

**No. of Blows 140-lb. Hammer, 20-in. Fall, Required to Drive 2-in. O.D. 1.375 in I.D. Sample One Foot

Scale 1"=

ORIGINAL
(Red)

50-5A

BORING LOG



FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. X-1982-6

DATE June 26, 1972

Made for: City of Richmond			
Project: Landfill Areas - East Richmond Rd. Site			
Hole No.: B-2	Total Depth: 50.0'	Elevation—Top of Hole: 43.5'	Hole Location:
Type of Boring: H. S. Auger	Started 5/25/72	Completed 5/25/72	Driller: Duty

Elevation	Depth	* Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	Sheet 2 REMARKS
3.5	40.0		Green Clayey Sand and Gravel		44.0	
				63	45.0	
					49.0	
-6.5	50.0		Boring Terminated @ 50.0'	66	50.0	

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

50-5A

BORING LOG

SINCE



1881

FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. X-1982-6

DATE June 26, 1972

Made for:		City of Richmond				
Project:		Landfill Areas - East Richmond Rd. Site				
Hole No.:		B-4	Total Depth: 50.0'		Elevation—Top of Hole:	Hole Location:
Type of Boring:		H. S. Auger	Started 5/26/72		Completed 5/26/72	Driller: Duty
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	REMARKS Sheet 1 of 2
	0.0		Brown Sandy Clay and Gravel	13	1.0	Water Data: Encountered Water @ 27.0' Water Level @ 45.25' with 49' of Casing Below Ground Surface @ 0 Hours
					4.0	
				9	5.0	
					9.0	
				17	10.0	
12.0			Brown Silty Medium Sand with Trace of Clay		14.0	
				7	15.0	
17.5			Miocene Marl. Gray Sandy Silty Clay		19.0	
				6	20.0	
					24.0	
				5	25.0	
27.0			Dark Gray Sandy Silt		29.0	
				12	30.0	
					34.0	
				17	35.0	
			Gray Clayey Silt with Gravel and		39.0	
39.0				48	40.0	

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

**No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2-in. O.D., 1.375 in I.D. Sample One Foot.

Scale 1"=

50-52

BORING LOG

SINCE



1881

FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. X-1982-6

DATE June 26, 1972

Made for: City of Richmond

Project: Landfill Areas - East Richmond Rd. Site

Hole No.: B-4

Total Depth: 50.0'

Elevation—Top of Hole:

Hole Location:

Type of Boring: H. S. Auger

Started 5/26/72

Completed 5/26/72

Driller: Duty

Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	Sample Blows	% Core Recovery	Sheet 2 REMARKS
	42.0		Fragments of Decayed Wood			
			Greenish Clayey Sand and Gravel	46	44.0 45.0	
	46.0		Greenish Silty Coarse Sand with Pea Gravel		49.0	
	50.0			42	50.0	
			Boring Terminated @ 50.0'			

SO-SA

BORING LOG

FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. X-1982-6

DATE June 26, 1972

Made for: City of Richmond						
Project: Landfill Areas - East Richmond Rd. Site						
Hole No.: B-5	Total Depth: 84.2	Elevation—Top of Hole: 45.4	Hole Location:			
Type of Boring: H. S. Auger	Started 5/23/72	Completed 5/24/72	Driller: Duty			
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	Sample Blows	% Core Recovery	REMARKS
45.4	0.0					Sheet 1 of 3 Water Data: Water Encountered @ 12.0' Water Level @ 27.3' with 84' of Casing Below Ground Surface @ 0 Hours. Water Level @ 23.3' with 84' of Casing Below Ground Surface @ 16 Hours. Water Level @ 23.7' with 73' of Plastic Pipe Below Ground Surface Upon Removal of Augers
44.9	0.5		Brown Sandy Silt and Gravel	5	1.0	
			Brown Sandy Clay with Trace of Gravel		4.0	
42.4	3.0			5	5.0	
			Brown and Gray Clayey Fine Sandy Silt		9.0	
38.4	7.0			7	10.0	
			Gray Fine Sandy Silt with Trace of Gravel and Boulders		14.0	
				63	15.0	
					19.0	
26.9	18.5			39	20.0	
			Gray and Green Clayey Sand and Gravel		24.0	
23.4	22.0			34	25.0	
			Green Clayey Sand with Trace of Gravel		29.0	
				40	30.0	
					34.0	
				42	35.0	
					39.0	
5.4	40.0			30	40.0	

BORING LOG

SINCE



1881

FROEHLING & ROBERTSON, INC.
 INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

ORIGINAL
(Red)
Report No. **X-1982-6**DATE **June 26, 1972**

Made for: City of Richmond	
Project: Landfill Areas - East Richmond Rd. Site	
Hole No.: B-5	Total Depth: 84.2'
Elevation—Top of Hole: 45.4'	Hole Location:
Type of Boring: H. S. Auger	Started 5/23/72 Completed 5/24/72 Driller: Duty

Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	REMARKS
5.4	40.0		Green Clayey Sand with Trace of Gravel			Sheet 2 of 3
					44.0	
				44	45.0	
					49.0	
				62	50.0	
					54.0	
				100	55.0	
					59.0	
				66	60.0	
					64.0	
				96	65.0	
					69.0	
				67	70.0	
28.5	73.0		Gray Clayey Sand with Seams of Clayey Silt		74.0	
				30	75.0	
33.6	79.0				79.0	
34.6	80.0		Gray and Green Clayey Sand	54	80.0	

ORIGINAL
(Red)

50-5A

BORING LOG



FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. **X-1982-6**

DATE **June 26, 1972**

Made for: City of Richmond	
Project: Landfill Areas - East Richmond Rd. Site	
Hole No.: B-5	Total Depth: 84.2'
Elevation—Top of Hole: 45.4'	
Hole Location:	
Type of Boring: H. S. Auger	Started 5/23/72 Completed 5/24/72
Driller: Duty	

Elevation	Depth	* Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	Sheet 3 REMARKS
	80.0					
	84.2		Gray and Green Clayey Sand			
				100/2	84.2	
			Boring Terminated @ 84.2'			

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

BORING LOG



FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

ORIGINAL
(Red)

Report No. **X-1932-6**DATE **June 26, 1972**

Made for: City of Richmond						
Project: Landfill Area - East Richmond Rd. Site						
Hole No.: B-6		Total Depth: 50.0'		Elevation—Top of Hole		Hole Location:
Type of Boring: H. S. Auger		Started 5/30/72		Completed 5/31/72		Driller: Duty
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	REMARKS
	0.0					
	2.5		Topsoil	9	1.0	Water Data: Encountered Water @ 28.5' Water Level @ 29.75' with 49' of Casing Below Ground Surface Water Level @ 25.40' with 48.5' Plastic Pipe Below Ground Surface Upon Removal of Augers
			Brown Sandy Clay and Gravel	73	4.0 5.0	
	6.0		Gray and Brown Silty Clay	5	9.0 10.0	
	13.0		Gray Sandy Silt	5	14.0 15.0	
				8	19.0 20.0	
				7	24.0 25.0	
	28.5		Gray Sandy Silt and Gravel	21	29.0 30.0	
	32.5		Green Silty Clay	62	34.0 35.0	
	34.5		Green Clayey Sand and Gravel			
				45	39.0 40.0	

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

**No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2-in. O.D., 1.375 in I.D. Sample One Foot.

Scale 1" =

BORING LOG


FROEHLING & ROBERTSON, INC.
 INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS
Report No. **X-1982-6**DATE **June 26, 1972**

Made for: City of Richmond	
Project: Landfill Area - East Richmond Rd. Site	
Hole No.: B-6	Total Depth: 50.0'
Elevation—Top of Hole:	
Hole Location:	
Type of Boring: H. S. Auger	Started 5/30/72 Completed 5/31/72 Driller: Duty

Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	Sheet 2 REMARKS
					44.0	
				55	45.0	
					49.0	
	50.0			72	50.0	
			Boring Terminated @ 50.0'			

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

**No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2-in. O.D., 1.375 in I.D. Sample One Foot.

Scale 1"=

BORING LOG

FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No. X-1982-6

DATE June 26, 1972

Made for: City of Richmond						
Project: Landfill Areas - East Richmond Rd. Site						
Hole No.: B-7	Total Depth: 50.0'	Elevation—Top of Hole:		Hole Location:		
Type of Boring: H. S. Auger	Started: 5/30/72	Completed: 5/30/72	Driller: Duty			
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	REMARKS
	0.0					Sheet 1 of 2
			Fill From Dump	7	1.0	Water Data: Encountered Water @ 23.0' Water Level @ 49.0' with 49' of Casing Below Ground Surface @ 30 Min. Water Level @ 40.6' with 44' of Plastic Pipe Below Ground Surface Upon Removal of Augers
					4.0	
				5	5.0	
					9.0	
				5	10.0	
					14.0	
				7	15.0	
					19.0	
				7	20.0	
23.0			Gray and Brown Silty Clay	10	24.0	
					25.0	
					29.0	
				7	30.0	
31.5			Brown and Gray Clayey Sand and Silt		34.0	
				9	35.0	
36.0			Dark Gray Sandy Silt		39.0	
				9	40.0	

*No. of Blows 250-lb. Hammer, 30-in. Fall, Required to Drive Casing One Foot.

**No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2-in. O.D., 1.375 in I.D. Sample One Foot.

Scale 1" =

ORIGINAL
(Red)

50-5A

BORING LOG

SINCE



1881

FROEHLING & ROBERTSON, INC.
INSPECTION ENGINEERS • CHEMISTS • BACTERIOLOGISTS

Report No.

X-1982-6

DATE

June 26, 1972

Made for:		City of Richmond				
Project:		Landfill Areas - East Richmond Rd. Site				
Hole No.:	B-7	Total Depth:	50.0'	Elevation—Top of Hole:	Hole Location:	
Type of Boring:	H. S. Auger	Started	5/30/72	Completed	5/30/72	Driller: Duty
Elevation	Depth	Casing Blows	CLASSIFICATION OF MATERIALS (Description)	** Sample Blows	% Core Recovery	Sheet 2 REMARKS
					44.0	
				7	45.0	
46.0			Dark Gray Sandy Silt with Gravel		49.0	
50.0				34	50.0	
			Boring Terminated @ 50.0'			

BORING LOG



ORIGINAL (Red)
FRUEHLING & ROBERTSON, INC.
 FIELD SERVICE LABORATORIES • ENGINEERING CHEMICAL
 "ONE HUNDRED YEARS OF SERVICE"

Report No. J-55-047

DATE April 20, 1982

Client: City of Richmond

Project: East Richmond Road Landfill

Boring No.: B-1

Total Depth: 59.0

Elevation:

Location:

Type of Boring: H. S. Auger

Started: 4/13/82

Completed: 4/13/82

Driller: Fishburne

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows	Sample Depth (Feet)	% Core Recovery	REMARKS Sheet 1 of 2
	0.0					
	1.0	Black Silty SAND w/Some Roots				<u>GROUNDWATER DATA</u> Water Level Stood @ 16.0' @ 0.5 hrs. w/26.0' of auger Water Level Stood @ 58.0' @ 0 hrs. and @ 57.0' @ 0.25 hrs. w/59.0' of auger Hole Caved in @ 42.0' and Water Level Stood @ 38.0' at 0 hrs. with no auger
		Medium-dense Reddish Tan Silty Medium SAND w/Some Medium Gravel	6	4.0		
			6	5.5		
	8.0					
		Medium-dense Tan Silty Medium SAND	7	9.0		
	11.5		5	10.5		
	13.0	Tan Clayey Medium SAND				
		Very Stiff Tan & Gray Silty CLAY w/a Trace of Fine Sand	4	14.0		
			6	15.5		
			12	16.5		
	19.0		UD-1	18.5		Note: "UD" denotes 3"O.D. Undisturbed Shelby Tube Sample *No Standard Penetration Tests Performed, Sample was obtained by dropping spoon
		Tan & Gray Silty CLAY w/a Little Fine Sand		19.0		
	23.0		UD-2	21.0		
				24.0		
		Gray Silty CLAY	*	25.5		
				26.0		
			UD-3	28.0		
			UD-4	30.0		
	37.0					
		Gray Silty Fine SAND		39.0		
			*	40.0		

*No of blows req'd for a 140 lb hammer dropping 30 in. to drive 2 in O.D., 1.375 in. I.D. sampler a total of 18 inches in three 6 in. increments. The sum of the last two increments of penetration is termed the standard penetration resistance N

Scale 1"=5' unless otherwise noted

BORING LOG

SINCE



FISCHLING & ROBERTSON, INC.

FIELD SERVICE LABORATORIES • ENGINEERING CHEMICAL
"ONE HUNDRED YEARS OF SERVICE"

ORIGINAL

(Red)

Report No. J-55-047

DATE April 20, 1982

nt: City of Richmond

Project: East Richmond Road Landfill

Boring No.: B-1 con't Total Depth: 59.0

Elevation:

Location:

Type of Boring: H. S. Auger

Started: 4/13/82

Completed: 4/13/82

Driller: Fishburne

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows	Sample Depth (Feet)	% Core Recovery	REMARKS
	40.0					Sheet 2 of 2
		Gray Silty Fine SAND				<u>GROUNDWATER DATA</u> *No Standard Penetration Test Performed, Sample was obtained by dropping spoon
	48.0					
		Gray Silty SAND and GRAVEL w/a Little Clay	*	49.0 50.0		
	59.0					
		Boring Terminated @ 59.0'				

*No. of blows req'd. for a 140 lb. hammer dropping 30 in. to drive 2 in O.D., 1.375 in. I.D. sampler a total of 18 inches in three 6 in. increments. The sum of the last two increments of penetration is termed the standard penetration resistance. N.

Scale 1"=5' unless otherwise noted

BORING LOG

SINCE



ORIGINAL
FROEHLING & ROBERTSON, INC.
 FIELD SERVICE LABORATORIES • ENGINEERING CHEMICAL
 "ONE HUNDRED YEARS OF SERVICE"

Report No. J-55-047

DATE April 20, 1982

Client: City of Richmond						
Project: East Richmond Road Landfill						
Boring No. B-2		Total Depth: 70.5		Elevation:		Location:
Type of Boring: H. S. Auger		Started: 4/8/82		Completed: 4/8/82		Driller: Fishburne
Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows	Sample Depth (Feet)	% Core Recovery	REMARKS
	0.0					Sheet 1 of 2
		Black Clayey SAND (FILL)				<u>GROUNDWATER DATA</u> Water Level Stood @ 37.9' @ 0 hrs. with 44.0' of Auger Water Level Stood @ 63.5' @ 0 hrs. with 69.0' of Auger Water Level Stood @ 58.0' @ 0 hrs. with No Auger
17.0		Very Stiff Tan Silty CLAY . w/Some Pieces of Glass & Plastic (Possible Fill)				
			10	24.0		
			8	25.5		
			10			
27.0		Stiff Tan & Reddish Brown Silty CLAY				
			3	29.0		
			5	30.5		
			8			
			UD-1	32.5		
			UD-2	34.5		
39.0		Firm Gray Silty CLAY				

*No. of blows req'd. for a 140 lb. hammer dropping 30 in. to drive 2 in O.D. 1.375 in. I.D. sampler a total of 18 inches in three 6 in. increments. The sum of the last two increments of penetration is termed the standard penetration resistance. N

Scale 1"=5' unless otherwise noted

BORING LOG



ORIGINAL
FROEHLING & ROBERTSON, INC.
FUEL SERVICE LABORATORIES • ENGINEERING CHEMICAL
"ONE HUNDRED YEARS OF SERVICE"

Report No. J-55-047

DATE April 20, 1982

Client: City of Richmond

Project: East Richmond Road Landfill

Boring No.: B-2 con't

Total Depth: 70.5

Elevation:

Location:

Type of Boring: H. S. Auger

Started: 4/8/82

Completed: 4/8/82

Driller: Fishburne

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows	Sample Depth (Feet)	% Core Recovery	REMARKS
	40.0					Sheet 2 of 2
		Firm Gray Silty CLAY		44.0		<u>GROUNDWATER DATA</u>
			2	*		*Wet Sample
			3	45.5		
			4			
			UD-3	47.5		Note: "UD" denotes 3"O.D.
			UD-4	49.5		Undisturbed Shelby Tube Sample
57.0		Gray Silty Fine SAND		59.0		
			**	60.5		
						**No Standard Penetration Tests Performed, Sample was obtained by dropping spoon
65.5		Gray Silty Medium to Coarse SAND & GRAVEL		69.0		
			**	70.5		
70.5		Boring Terminated @ 70.5'				

*No. of blows req'd. for a 140 lb. hammer dropping 30 in. to drive 2 in O.D., 1.375 in. I.D. sampler a total of 18 inches in three 6 in. increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

Scale 1"=5' unless otherwise noted

BORING LOG



FROEHLING & ROBERTSON, INC.
 FIELD SERVICE LABORATORIES • ENGINEERING • CHEMICAL
 "ONE HUNDRED YEARS OF SERVICE"

Report No. J-55-047

DATE April 20, 1982

Client: City of Richmond

Project: East Richmond Road Landfill

Boring No.: B-3

Total Depth: 74.0

Elevation:

Location:

Type of Boring: H. S. Auger

Started: 4/2/82

Completed: 4/2/82

Driller: Fishburne

Elevation	Depth 0.0	DESCRIPTION OF MATERIALS (Classification)	Sample Blows	Sample Depth (Feet)	% Core Recovery	REMARKS Sheet 1 of 2
		Stiff Gray Silty CLAY w/a Trace of Fine Sand				<u>GROUNDWATER DATA</u> Water Stood @ 67.2' @ 0 hrs. w/74.0' of Auger Hole Caved in @ 64.0' and was dry w/no Auger
				5.0		
			UD-1	7.0		
			UD-2	9.0		
				14.0		
			3	15.5		
			6			
				24.0		
			4			
			6	25.5		
			7			
		Stiff Dark Gray Silty CLAY w/Some Fine Sand and a Trace of Mica	UD-3	27.5		
			UD-4	29.5		
				39.0		
			3			
			4			
		Stiff Gray to Tan Silty CLAY w/Lenses of Fine Sand				

23.0

36.0

*No. of blows req'd. for a 140 lb. hammer dropping 30 in. to drive 2 in. O.D., 1.375 in. I.D. sampler a total of 18 inches in three 6 in. increments. The sum of the last two increments of penetration is termed the standard penetration resistance. N

Scale 1"=5' unless otherwise noted

BORING LOG



ORIGINAL
 (Red)
 FROEHLING & ROBERTSON, INC.
 FULL SERVICE LABORATORIES • ENGINEERING CHEMICAL
 "ONE HUNDRED YEARS OF SERVICE"

Report No. J-55-047

1881

DATE April 20, 1982

Client:		City of Richmond							
Project:		East Richmond Road Landfill							
Boring No.: B-3 con't		Total Depth: 74.0		Elevation:		Location:			
Type of Boring: H. S. Auger		Started: 4/2/82		Completed: 4/2/82		Driller: Fishburne			
Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	Sample Blows	Sample Depth (Feet)	% Core Recovery	REMARKS Sheet 2 of 2			
	40.0	Stiff Gray to Tan Silty CLAY w/Lenses of Fine Sand	10	40.5		<u>GROUNDWATER DATA</u> Note: "UD" denotes 3"O.D. Undisturbed Shelby Tube Sample			
				41.0					
			UD-5	43.0					
			UD-6	45.0					
	52.0	Very Loose Dark Greenish Gray Silty Fine SAND w/Some Shell Fragments and a Trace of Clay		54.0		*No Standard Penetration Tests Performed, Sample obtained by dropping spoon			
			*	55.5					
	63.0	Very Loose Gray Clayey SAND w/Some Medium Gravel & Boulders and Shell Fragments		64.0					
			*	65.5					
	74.0	Boring Terminated @ 74.0'							

*No. of blows req'd for a 140 lb. hammer dropping 30 in. to drive 2 in O.D., 1.375 in. I.D. sampler a total of 18 inches in three 6 in. increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

Scale 1"=5' unless otherwise noted



FROEHLING & ROBERTSON, INC.

FULL SERVICE LABORATORIES • ENGINEERING/CHEMICAL

"OVER ONE HUNDRED YEARS OF SERVICE"

ORIGINAL
(Red)

Richmond, Virginia

August 26, 1982

No. J-55-135

Report of: Soil Borings

Made for: City of Richmond
Dept. of Public Works
900 East Broad Street
Richmond, VA 23219

Project: Water Monitoring Wells @ East Richmond Road Landfill

Location: Richmond, Virginia

Date Made: August 12 - August 20, 1982

Upon authorization from Mr. S. Feitig, test wells were set at locations shown to our field crew by Mr. Feitig.

The test wells were made by means of continuous flight auger.

This report outlines the methods, procedures, and the results of the performance of a test of soil samples, and is not to be construed as a soil engineering, foundation engineering or geological engineering report.

Respectfully,

FROEHLING & ROBERTSON, INC.

John P. Cassidy, Manager
Geotechnical Department

JPC/dw



CHARTER MEMBER



CHARTER MEMBER



MEMBER SINCE 1904



ORIGINAL
(Red)

CITY OF RICHMOND
GROUNDWATER MONITORING WELL INSTALLATION
EAST RICHMOND ROAD LANDFILL

<u>WELL #</u>	<u>DATE</u>	<u>DEPTH</u>	<u>STRATA</u>
8	8/12/82	0.0-2.0'	Tan Clayey SAND w/Gravel
		2.0-5.5'	Dark Gray Sandy CLAY w/Organics (Wood, Musty Smell)
		5.5-7.5'	Light Gray Sandy CLAY w/Trace of Gravel
		7.5-9.0'	Tan Silty SAND & GRAVEL (Hit Water)
		9.0-40.0'	Tan Silty SAND w/Trace of Clay (wet)
		Boring Terminated @ 40.0'	
		Water Stood at 9.0' @ 0 hrs. w/no auger	
		Well was set at 40.0'	
6	8/12/82	0.0-4.5'	Brown Sandy CLAY & GRAVEL
		4.5-8.0'	Tan Sandy GRAVEL
		8.0-14.5'	Tan to Gray Clayey SAND
		14.5-17.5'	Concrete Rubble or Boulders
		17.5-40.0'	Gray Sandy CLAY
		Boring Terminated @ 40.0'	
		Water Stood at 31.0' @ 24+ hours	
		Well was set at 40.0'	
B-9	8/16/82	0.0-0.5'	Brown Silty SAND w/Some Gravel
		0.5-4.0'	Tan Silty SAND w/Trace Clay
		4.0-6.5'	Brown Clayey SAND & GRAVEL
		6.5-14.0'	Gray & Tan Clayey SAND w/Little Gravel
		14.0-21.0'	Tan Clayey Medium to Coarse SAND w/Little Gravel
		21.0-27.0'	Tan Silty SAND w/Little Gravel
		27.0-32.0'	Gray Silty SAND w/Trace of Gravel & Clay
		32.0-40.5'	Gray Clayey SAND w/Little Silt
		Boring Terminated @ 40.5'	
		Water Stood at 35.0' @ 2 hrs. w/no auger	
		Well was set at 40.5'	
7	8/19/82	0.0-9.0'	Brown to Tan Silty SAND w/Some Gravel
		9.0-30.0'	Brown to Black Sandy SILT w/Organics
		30.0-35.0'	Gray SAND w/Some Silt (Hit Water)
		35.0'	Gray Silty SAND w/Trace of Clay
		Boring Terminated @ 35.0'	
		Water Stood @ 17.0' @ 0 hrs.	
		@ 14.0' @ 24 hrs.	
		Well was set at 35.0'	

SINCE



1881

-2-

ORIGINAL
(Red)

<u>WELL #</u>	<u>DATE</u>	<u>DEPTH</u>	<u>STRATA</u>
7 (Abandoned)	8/18/82	0.0-1.0'	Tan Sandy GRAVEL
		1.0-3.0'	Brown Sandy GRAVEL
		3.0-5.5'	Brown Sandy SILT w/Some Gravel
		5.5-13.0'	Gray SILT w/Trace of Clay & Organics
		13.0-16.0'	Brown Silty SAND w/Some Gravel
		16.0-35.0'	Gray Silty SAND
		35.0-40.0'	Gray Medium SAND
		Boring Terminated @ 40.0'	
		Hole was abandoned	
		Water Stood @ 27.0' @ 1 hr.	
10	8/20/82	0.0-3.0'	Brown Sandy SILT w/Some Gravel
		3.0-6.0'	Black Sandy GRAVEL
		6.0-12.0'	Gray Silty SAND (wet)
		12.0-26.0'	Tan Silty SAND (wet)
		26.0-40.0'	Brown Silty SAND (wet)
		40.0-130.0'	Gray-Brown Sandy SILT (wet) to Gray Sandy Clayey SILT
		Boring Terminated @ 130.0'	
		Water Stood @ 92.0' @ 24 hrs.	
		Well was set at 130.0'	